



Workshop Manual

TCD 2012 2V

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The engine company.

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1 Foreword



- Read and observe the information in this documentation. You will avoid accidents, retain the manufacturer's warranty and possess a fully functional and ready to operate engine.
- This engine is built exclusively for purpose according to the scope of delivery - defined by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user bears the sole risk.
- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with this and are aware of the risks involved.
- Make sure that this documentation is available to everyone involved in operation, maintenance and repair and that they have understood the contents.
- Failure to observe this documentation may lead to malfunctions and engine damage as well as injury to persons for which the manufacturer will not accept any liability.
- A prerequisite for proper maintenance and repair is the availability of all the necessary equipment, conventional and special tool, which must be in perfect condition.
- Engine parts such as springs, clamps, elastic retaining rings etc. pose an increased risk of injury when handled incorrectly.
- The pertinent rules for the prevention of accidents and other generally recognised health and safety regulations must be observed.
- Maximum economy, reliability and long life is only guaranteed when using DEUTZ original parts.
- Repair of the engine must correspond to its use for the intended purpose. Only parts released by the manufacturer for the respective purpose may be used for conversion work. Unauthorised modification to the engine excludes manufacturer liability for resulting damage. Failure to observe this will void the warranty!
- The engines made by DEUTZ are developed for a wide range of applications. A wide range of variants ensures that the user's particular requirements are met.
- The engine is equipped according to your installation needs, which means that not all the parts and components described in this documentation are necessarily installed in your engine.
- We have done our best to highlight the differences so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

We are at your service for any questions you may have in this matter.

Your DEUTZ AG

2 General



DEUTZ engines are the product of years of research and development. The profound expertise gained through this, in combination with high demands on quality, attests to the fact that our engines possess all the qualities of long life, high reliability and low fuel consumption. It goes without saying that the high environmental protection requirements are also met.

Maintenance and care are the only way the engine can satisfy the demands you make on it. Compliance with the prescribed maintenance times and the careful execution of maintenance and care work are therefore essential. Difficult operating conditions, deviating from normal operation, must be particularly heeded.

Please consult one of our service representatives responsible for operating faults and spare parts questions. Our trained specialists ensure fast and professional repairs using original DEUTZ spare parts.

Original spare parts from DEUTZ AG are always manufactured according to the state of the art.

3 User notes

3.1 General

The documentation of the workshop manual has been created based on the engine available at the time of going to press.

There may be deviations in the descriptions, illustrations and parts due to further developments.

The maintenance work described in the operating manual and in the workshop manual must be carried out on schedule and completely. The maintenance personnel must have the necessary technical knowledge to perform the work. Safety and protection devices which are removed during maintenance work must be replaced again afterwards.

Caution!

The rules for the prevention of accidents and the safety regulations must be observed during maintenance work.

Reference is made in the workshop manual job cards to the regulations in chapter 3.2. These must be read before working on the engine and must be strictly followed.

The maintenance intervals and the work to be performed are specified in the maintenance schedule of the operating manual. The job cards contain technical documentation of the execution of maintenance work.

3.2 Specifications

3.2.1 Accident prevention and safety regulations

The legally prescribed rules for the prevention of accidents must be observed. These are available from professional associations or from dealers. These are dependent on the application site, operating mode and the operating and auxiliary materials being used.

Special protection measures are specified depending on the work being carried out, and are identified in the job description.

Among other things it generally applies that:

- for the personnel:
 - Only briefed personnel may operate or maintain the engine. Unauthorised persons are prohibited access to the machine room.
 - Wear close-fitting clothing and ear protectors in the machine room when the engine is in operation.
 - Only deploy trained personnel to do repairs and maintenance work.
 - Do not work on the fuel system when the engine is running. The fuel system is under high pressure - danger of death.
 - Go to the workshop immediately in case of leaks in the fuel system.
- for the engine room:
 - Ensure adequate ventilation (do not cover air shafts).
 - Provide first aid kit and suitable fire extinguishers. Check the filling and readiness for operation regularly.
 - Only store inflammable materials in the machine room if they are essential for operation of the system.
 - Smoking and naked flames are prohibited in the machine room.
- for operation, maintenance and repairs on the engine:
 - Wait 30 seconds after switching off the engine before working on the fuel system.
 - Only start the engine when all the protective devices have been fitted. Make sure no-one is standing in the danger area.
 - Cleaning, maintenance and repair work may only be performed with the engine at a standstill and secured against starting.
 - Injection pipes and high pressure pipes must not be deformed.
 - Damaged injection pipes and high-pressure pipes must be renewed.

- Injection lines and high pressure fuel lines must never be connected when the engine is running.
- Do not place hands near to a leak in the high pressure fuel system.
- Also carefully check all high pressure components visually before performing tests on the running engine. Wear suitable protective clothing (for example protective glasses). Leaks are a potential source of danger for workshop personnel.
- Even if no leaks are discernible on the high pressure fuel system, the workshop personnel should avoid the immediate danger zone or wear suitable protective clothing (such as protective glasses) when performing tests on the running engine and during the first trial run.
- Always stay out of range of a fuel jet, as it could cause severe injury.
- Smoking is strictly prohibited when working on the fuel system.
- Do not work near to sparks and flames.
- Never disconnect an injector when the engine is running.

3.2.2 Cleanliness instructions and measures for handling the DEUTZ Common Rail System

The DEUTZ Common Rail system used in the DEUTZ engines consists of high-precision components which are exposed to extreme stress. Great attention must be paid to cleanliness when working on the fuel system due to the high precision technology.

Notes and measures to be observed before starting work on the fuel system

- The fuel system must be closed. Make a visual inspection for leaks / damage to the fuel system.
- Clean the whole engine and engine room with the system closed before starting work on the fuel system.
- The engine must be dry when you start working on the fuel system.
- Blowing (dry) with compressed air is only permissible with the fuel system closed.
- When using a steam jet, first cover up the control unit, the cable plugs, all other electrical plug connections and the generator. Also, the steam jet may not be pointed directly at them.
- Electrical plug connections must be plugged when spraying.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
- Only work on the fuel system in a clean environment (no dust, no grinding or welding). Avoid draughts (dust). Clean the workshop floor regularly. No brake or performance test benches may be kept or operated in the same room.
- Air currents which kick up dust, such as those caused by brake repairs or the starting of engines, should be avoided.
- For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
- No general machine tools may be operated in this room.
- Regular cleaning of the workshop area is mandatory. Draughts, ventilation and heating fans should be minimised.
- Areas of the engine room from which particles of dust could be loosened (for example the bottom part of the tipped driver cab) must be covered with fresh clean film.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

Notes and measures to be observed during work on the fuel system or with the fuel system open.

- Only work in clean overalls.
- Only lint-free cleaning cloths may be used for work on the fuel system.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device. Only suction may be used in assembly work on the open fuel system.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.
- Do not use used cleaning fluid or test fluid for cleaning.
- Compressed air must not be used for cleaning on the open fuel system.
- Work on removed components may only be performed at a suitably equipped workbench.
- When removing and installing components, no materials which can leave behind particles or fibres (cardboard, wood, cloths) may be used.

- Removed parts may only be rubbed down with clean, lint-free cloths. No dirt particles may be rubbed into the components.
- Openings on the components and on the engine must be closed immediately with suitable stoppers/caps.
- The stoppers/caps may only be removed immediately before installing.
- Store stoppers/caps free from dust and dirt in the original packaging and dispose of after using once.
- Only remove new parts from the original packaging just before installation.
- Removed components must be kept in new, sealable bags or - if available - in the packaging of the new parts.
- Always use the original packaging of the new part to send back the removed components.

Notes and measures for the vehicle workshop

- For work such as removal and installation on defective hydraulic components on the Common Rail System it is recommended to partition off a separate workshop area in the factory. This must be separate from other areas in which general vehicle repairs such as brake repairs are carried out.
- The workshop floor is sealed or tiled.
- No welding gear, grinders, general machine tools, brakes or performance test benches may be operated in this room.
- Regular cleaning of the workshop area is mandatory. Draughts, ventilation systems and heating fans should be minimised.

Notes and measures for workbench and tools in the vehicle hall

- A special workbench must be set up for work on the removed components.
- Clean the extraction and installation tools regularly and keep in a closed tool cabinet.
- Remove loose parts (for example paint chips from assembly work) with an industrial vacuum cleaner or other suction device.
- Working materials and tools must be cleaned before work. Only use tools without damage to the chrome plating or tools which are not chrome-plated.

3.2.3 Disposal regulations

The work described in the operating manual and workshop manual necessitates renewal of parts and operating materials among other things. The renewed parts / operating materials must be stored, transported and disposed of properly. The owner himself is responsible for this.

Disposal includes recycling and the scrapping of parts / operating materials, although recycling has priority.

Details of disposal and their monitoring are governed by regional, national and international laws and directives which the system operator must observe on his own responsibility.

3.3 Operating manual and workshop manual

To structure the information to suit the user, the service documentation is divided into operating manual and workshop manual.

The operating manual contains a general description and instructions for all other maintenance work.

It contains the following chapters:

1. Contents, General
2. Engine description
3. Operation
4. Operating media
5. Maintenance
6. Care and maintenance work
7. Faults, causes and remedies
8. Engine conservation
9. Technical data
10. Service

The workshop manual assumes knowledge of the contents of the operating manual. This applies especially for the safety regulations. The workshop manual describes repairs to the engine and components for which more effort and appropriately qualified technicians are required.

3.4 Job cards

The job cards are divided in the workshop manual into "W" and "I" job cards.

The "W" job card documents standard repairs on the engine and/or its components. The necessary tools and special tools are also specified in the "W" job card.

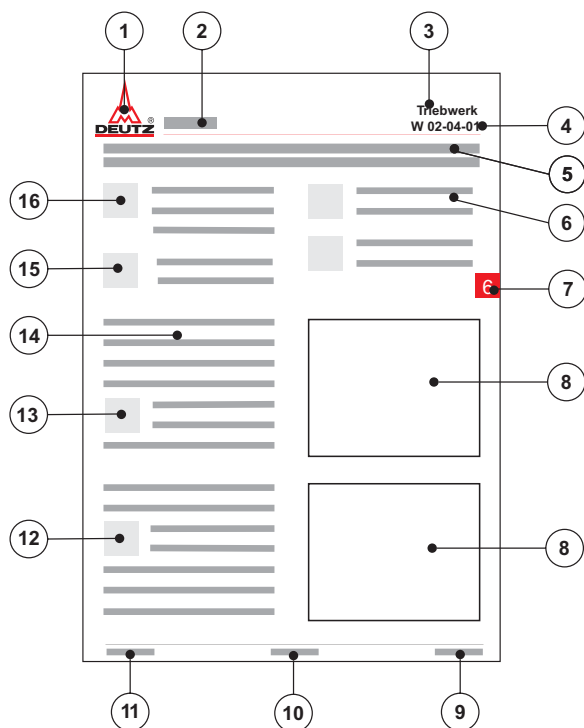
The "I" job card additionally documents the appropriate work procedures for repairing the engine and/or its components. The workshop must satisfy special conditions to perform these work procedures. Special tools and machine tools must be available, for example.

3.4.1 Numbering of job cards

The job card numbers follow the pattern **W 02-04-01**. The individual parts of this pattern are explained below:

- **W 02-04-01**: Documentation type
 - **W** Workshop manual
 - **I** Repair instructions
- **W 02-04-01**: Maintenance group
 - 00 ... General / interdisciplinary activities
 - 01 ... Cylinder head
 - **02** Drive system
 - 03 ... Crankcase
 - 04 ... Engine control system
 - 05 ... Speed governing
 - 06 ... Exhaust system / Charging
 - 07 ... Fuel system
 - 08 ... Lube oil system
 - 09 ... Cooling system
 - 10 ... Compressed air system
 - 11 ... Monitoring system
 - 12 ... Other components
 - 13 ... Electrical system
- **W 02-04-01**: Component grouping
- **W 02-04-01**: Consecutive number

3.4.2 Structure of a job card



1. DEUTZ AG, publisher of service documentation
2. Engine type (e.g. TCD 2013 4V)
3. Maintenance group
4. Job card number or topic
5. Title of job card
6. Reference to other job cards
7. Chapter
8. Graphic or photo
9. DEUTZ internal creation number and technical order number
10. Page number
11. Date of issue of job card
12. Note
13. Danger / Important
14. Work sequence
15. Special tools; auxiliary materials
16. Conventional tools

3.5 Explanation of symbols



Danger!

of death or to health. Must be observed!
For example: The incorrect use or conversion of the turbocharger can lead to serious injury.



Caution!

Danger to the component/engine. Non-compliance can lead to destruction of the component/engine.
Must be observed!



Note

General notes on assembly, environmental protection etc. No potential danger for man or machine.



Tool

Conventional and special tools required for the work.



Auxiliary materials

Working materials required in addition to the tools for performing the work (e.g. greases, oils, adhesives, sealants)



References

to important documents or job cards for the work process.
For example: Job card W 04-05-05



Reference

to a document or a job card within the work process.



Test and setting data

The necessary values are specified here. If several values are necessary, a cross reference is given to the Test and Setting Values table.
For example:
ID no. P01 61 = valve clearance, inlet



Tightening specification

The necessary values are specified here. If several values are necessary, a cross reference is given to the Tightening Specifications table.
For example:
ID No. A01 001 = cylinder head screws

4 Technical data

4.1 Testing and setting data

ID no.	Designation	Information	Series			Value	Unit
General engine data							
P00 01	Length of engine		TCD 2012	L6	2V	1108	mm
P00 02	Width of engine		TCD 2012	L6	2V	742	mm
P00 03	Height of engine		TCD 2012	L6	2V	901,5	mm
		Deep oil tray				1101,05	
P00 04	Engine weight according to DIN 70020-A	approx.	TCD 2012	L4	2V	410	kg
				L6	2V	530	
P00 10	Working principle		TCD 2012		2V	Four-stroke	-
P00 20	Combustion process		TCD 2012		2V	Diesel direct injection	-
P00 30	Total volume		TCD 2012	L4	2V	4038	cm ³
				L6	2V	6067	
P00 31	Bore		TCD 2012		2V	98	mm
						101	
						101,5	
P00 32	Stroke		TCD 2012		2V	126	mm
P00 40	Compression ratio		TCD 2012		2V	18	-
P00 50	Direction of rotation	looking onto the flywheel	TCD 2012		2V	left	-
P00 51	Compression pressure		TCD 2012		2V	30 - 38	bar
						3000 - 3800	kPa
P00 71	Ignition sequence		TCD 2012	L4	2V	1 - 3 - 4 - 2	-
				L6	2V	1 - 5 - 3 - 6 - 2 - 4	
Cylinder head							
P01 01	Valve seat ring bore, inlet	Standard, fit H7	TCD 2012		2V	46 ^{+0,025} ₋₀	mm
P01 02	Valve seat insert bore, outlet	Standard, fit H7	TCD 2012		2V	39,9 ^{+0,025} ₋₀	mm

ID no.	Designation	Information	Series			Value	Unit
P01 05	Valve guide, bore in cylinder head	Standard, fit H6	TCD 2012		2V	$8,008^{+0,025}_{-0}$	mm
P01 08	Cylinder head, height	Standard	TCD 2012		2V	90	mm
Valve seat insert							
P01 21	Valve seat insert outside diameter, inlet	Standard, 30 degrees	TCD 2012		2V	$46,09^{0}_{0,02}$	mm
P01 22	Valve seat insert outside diameter, outlet	Standard, 45 degrees	TCD 2012		2V	$39,99^{0}_{0,02}$	mm
Valve							
P01 31	Valve shaft diameter, inlet	Standard, fit h7	TCD 2012		2V	$7,94^{0}_{-0,04}$	mm
P01 32	Valve shaft diameter, outlet	Standard, fit h7	TCD 2012		2V	$7,94^{0}_{-0,04}$	mm
P01 33	Valve stem clearance, inlet		TCD 2012		2V	0,012	mm
P01 34	Valve stem clearance, outlet		TCD 2012		2V	0,014	mm
P01 35	Valve edge thickness, inlet		TCD 2012		2V	2,36	mm
P01 36	Valve edge thickness, outlet		TCD 2012		2V	1,8	mm
P01 37	Valve head diameter, inlet		TCD 2012		2V	$44,4^{+0,1}_{-0,1}$	mm
P01 38	Valve head diameter, outlet		TCD 2012		2V	$38,7^{+0,1}_{-0,1}$	mm
Valve seat							
P01 45	Valve lag dimension, inlet		TCD 2012		2V	$0,9^{+0,15}_{-0,1}$	mm
P01 46	Valve lag dimension, outlet		TCD 2012		2V	$0,9^{+0,15}_{-0,1}$	mm
P01 47	Valve seat angle, inlet		TCD 2012		2V	30	°
P01 48	Valve seat angle, outlet		TCD 2012		2V	45	°
Valve spring							
P01 51	Valve spring length (unclamped normal)		TCD 2012		2V	$59^{+1,9}_{-1,9}$	mm
	Valve spring wire diameter					$4^{+0,03}_{-0,03}$	

ID no.	Designation	Information	Series			Value	Unit
Valve clearance							
P01 61	Valve clearance, inlet (on cold engine)	on cold engine, oil temperature < 80 °C, after a cooling down time of at least 0.5 h	TCD 2012		2V	75	°
P01 62	Valve clearance, outlet (on cold engine)	on cold engine, oil temperature < 80 °C, after a cooling down time of at least 0.5 h	TCD 2012		2V	120	°
P01 63	Valve clearance setting	Valve overlap as per setting diagram, see: Table T01 63	TCD 2012		2V	-	-
P01 64	Clearance between control piston and rocker arm		TCD 2012		2V	144	°
Rocker arm/bracket							
P01 72	Rocker arm, bore, diameter, outlet		TCD 2012		2V	$21,02^{+0,033}_{-0}$	mm
P01 73	Rocker arm, bore, diameter, inlet		TCD 2012		2V	$21,02^{+0,033}_{-0}$	mm
P01 74	Rocker arm pin	Diameter, fit h7	TCD 2012		2V	$21^{+0}_{-0,021}$	mm
Drive system							
Main bearing pin							
P02 03	Main bearing pin	Standard, diameter	TCD 2012		2V	$84^{+0}_{-0,02}$	mm
P02 04	Crankshaft main bearing pin	two underdimension stages per	TCD 2012		2V	0,25	mm
P02 07	Crankshaft main bearing pin and lifting journal, hardness	Standard HRC	TCD 2012		2V	55^{+6}	HRC
Fit bearing pin							
P02 10	Fit bearing pin	two underdimension stages per	TCD 2012		2V	0,25	mm
P02 11	Width of fit bearing pin		TCD 2012		2V	$32,2^{+0,04}$	mm
P02 12	Width of fit bearing pin, overdimension	one overdimension stage	TCD 2012		2V	0,4	mm

ID no.	Designation	Information	Series			Value	Unit
Lifting journal							
P02 21	Width of lifting journal		TCD 2012		2V	32,08 ⁺⁰ _{+0,02}	mm
P02 22	Diameter of the lifting journal		TCD 2012		2V	69,994 ⁺⁰ _{-0,02}	mm
P02 23	Diameter of the lifting journal	one underdimension stage	TCD 2012		2V	0,25	mm
P02 26	Dynamic run-out, crankshaft	Max. permissible deviation:	TCD 2012		2V	0,1	mm
Main bearing							
P02 31	Main bearing shells (inside diameter)	Standard	TCD 2012		2V	83,980 - 84,000	mm
P02 32	Main bearing shells, underdimension	two underdimension stages per	TCD 2012		2V	0,25	mm
P02 33	Theoretical clearance between main bearing and crankshaft		TCD 2012		2V	0,03 - 0,092	mm
P02 34	Permissible axial clearance of crankshaft		TCD 2012		2V	0,1 - 0,28	mm
P02 35	Stop ring, thickness	Standard (upper and lower half)	TCD 2012		2V	2,00 - 2,05	mm
P02 36	Stop ring, oversize	1. Stage = 0.2 mm	TCD 2012		2V	2,20 - 2,25	mm
Con-rod							
P02 43	Small end bush (installed), inside diameter	unmachined precision bore	TCD 2012		2V	40 ^{+0,045} _{+0,035}	mm
P02 44	Small end bush, outside diameter		TCD 2012		2V	43,070 - 43,110	mm
P02 45	Piston bolt clearance between piston bolt and small end bush		TCD 2012		2V	0,025 - 0,041	mm
P02 49	Bore for small end bush in the con rod		TCD 2012		2V	43 ^{+0,02} ₋₀	mm
Con rod bearing							
P02 51	Con rod bearing shell top and bottom, width		TCD 2012		2V	24 _{-0,3}	mm
P02 52	Con rod bearing shells (installed), inside diameter		TCD 2012		2V	70,026 - 70,065	mm
P02 54	Con rod bearing underdimension per stage	one underdimension per	TCD 2012		2V	0,25	mm

ID no.	Designation	Information	Series			Value	Unit
P02 55	Con rod bearing, bore in con rod	H6	TCD 2012		2V	$73,6^{+0,019}_{-0}$	mm
P02 56	Theoretical clearance between the con rod bearing / lifting journal		TCD 2012		2V	0,036 - 0,095	mm
Piston bolt							
P02 61	Piston bolt, diameter		TCD 2012		2V	$40^{+0}_{0,006}$	mm
Piston identification of the installation position on the piston base							
P02 71	Diameter normal measuring point 1	Measuring point 1 = height 15 mm	TCD 2012		2V	$97,9^{+0,007}_{-0,007}$	mm
						$100,68^{+0,007}_{-0,007}$	
P02 72	Diameter normal measuring point 2	Measuring point 2 = height 50 mm	TCD 2012		2V	$97,79^{+0,009}_{-0,009}$	mm
						$100,79^{+0,009}_{-0,009}$	
P02 73	Diameter normal measuring point 3	Measuring point 3 = height 80.5 mm	TCD 2012		2V	$100,35^{+0,010}_{-0,010}$	mm
						$97,35^{+0,010}_{-0,010}$	
P02 75	Piston projection	1 hole, cylinder head gasket, 1.2 mm	TCD 2012		2V	0,33 - 0,55	mm
P02 76	Piston projection	2 hole, cylinder head gasket, 1.3 mm	TCD 2012		2V	0,56 - 0,65	mm
P02 77	Piston projection	3 hole, cylinder head gasket, 1.4 mm	TCD 2012		2V	0,66 - 0,76	mm
P02 78	Piston bolt, bore		TCD 2012		2V	$40^{+0,005}_{+0,011}$	mm
Piston rings							
P02 81	Piston ring 1st ring, double-sided keystone ring	Outside diameter/inside diameter x height	TCD 2012		2V	98/89.8 x 3	mm
						101/92.6 x 2.5	
						101.5/93.1 x 2.5	
P02 82	Piston ring 2nd ring, taper-faced ring	Outside diameter/inside diameter x height	TCD 2012		2V	98/89.8 x 2.03	mm
						101/92.6 x 2	
						101.5/93.1 x 2	

ID no.	Designation	Information	Series			Value	Unit
P02 83	Piston ring 3rd ring, bevelland-edge oil control ring with coiled spring expander	Outside diameter/inside diameter x height	TCD 2012		2V	98/90.7 x 3	mm
						101/93.3 x 3	
						101.5/93.8 x 3	
P02 84	Joint clearance, piston ring 1 (cylinder diameter 98 mm)	Identification "TOP" in direction of combustion chamber	TCD 2012		2V	0,2 - 0,35	mm
	Joint clearance, piston ring 1 (cylinder diameter 101 mm)					0,25 - 0,4	mm
	Joint clearance, piston ring 1 (cylinder diameter 101.5 mm)						
P02 85	Joint clearance, piston ring 2 (cylinder diameter 98 mm)	Identification "TOP" in direction of combustion chamber	TCD 2012		2V	1,5 - 2,0	mm
	Joint clearance, piston ring 2 (cylinder diameter 101 mm)						
	Joint clearance, piston ring 2 (cylinder diameter 101.5 mm)						
P02 86	Joint clearance, piston ring 3 (cylinder diameter 98 mm)	Identification "TOP" in direction of combustion chamber	TCD 2012		2V	0,3 - 0,6	mm
	Joint clearance, piston ring 3 (cylinder diameter 101 mm)					0,3 - 0,55	
	Joint clearance, piston ring 3 (cylinder diameter 101.5 mm)						
P02 87	Axial clearance, 1st ring (double-sided keystone ring)	Wear limit	TCD 2012		2V	measure with trapezoidal groove wear gauge (contact with piston)	-
P02 88	Axial clearance, 2nd ring (taper-faced ring) (piston diameter 98 mm)		TCD 2012		2V	0,065 - 0,11	mm
	Axial clearance, 2nd ring (taper-faced ring) (piston diameter 101 mm)					0,09 - 0,11	

ID no.	Designation	Information	Series			Value	Unit
P02 89	Axial clearance, 3rd ring (bevelland-edge oil control ring) (piston diameter 98 mm)		TCD 2012		2V	0,04 - 0,08	mm
	Axial clearance, 3rd ring (bevelland-edge oil control ring) (piston diameter 101 mm)						
P02 95	Piston ring joint, installation position		TCD 2012		2V	offset 120	°
P02 96	Bevelland-edge oil control ring	Offset spring ring joint to ring joint	TCD 2012		2V	180	°
Crankcase							
Camshaft bearing							
P03 11	Camshaft bearing crankcase bore	H7	TCD 2012		2V	69 ^{+0,030}	mm
P03 12	Camshaft bearing outside diameter	normal	TCD 2012		2V	69,1 ^{+0,04}	mm
P03 13	Camshaft bearing (bush)	Inside diameter when installed	TCD 2012		2V	65 - 65,054	mm
Main bearing bore							
P03 21	Main bearing bore in crankcase	Standard, H6	TCD 2012		2V	89 ^{+0,022} ₀	mm
Cylinder liners							
P03 31	Cylinder bore	Standard, Slipfit	TCD 2012		2V	98 ^{+0,02}	mm
		Outside diameter				101 ^{+0,013} _{-0,005}	
		Standard, H6				101 ^{+0,022} ₀	
P03 36	Collar height of the cylinder liner (Slipfit)		TCD 2012		2V	4,5 _{-0,02}	mm
Engine control							
Camshaft							
P04 31	Camshaft bearing pin diameter	Standard	TCD 2012		2V	64,930 - 64,950	mm
P04 32	Theoretical clearance (radial clearance)		TCD 2012		2V	0,050 - 0,124	mm

ID no.	Designation	Information	Series			Value	Unit
Fuel system							
Injector							
P07 51	Nozzle type injector		TCD 2012		2V	DLLA 146 PV3 / 7-hole	-
P07 71	DEUTZ Common Rail system pressure	High pressure range	TCD 2012		2V	300 - 1600	bar
Cooling system							
P09 11	Coolant thermostat start of opening		TCD 2012		2V	83	°C
P09 13	Coolant thermostat stroke distance		TCD 2012		2V	at least 8	mm

T01 63

Setting of valve and control piston clearance

Engine TCD 2012/2013 L04 2V

Ignition sequence: 1 - 3 - 4 - 2

Valves	Cylinder			
Set to	1	3	4	2
overlap	4	2	1	3



Valve overlap: Outlet valve is not closed, inlet valve begins opening.

The outlet valve opens briefly by 2 mm when the inlet valve is fully open. This is not the valve overlap!

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4

T01 63

Setting of valve and control piston clearance

Engine TCD 2012/2013 L06 2V

Ignition sequence: 1 - 5 - 3 - 6 - 2 - 4

Valves	Cylinder					
Set to	1	5	3	6	2	4
overlap	6	2	4	1	5	3



Valve overlap: Outlet valve is not closed, inlet valve begins to open.

The outlet valve opens briefly by 2 mm when the inlet valve is fully open. This is not the valve overlap!

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4.2 Tightening specifications

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A00 001	Clamping bracket on crankcase			TCD 2012		2V	70 Nm	
A00 002	Clamping bracket on adapter for assembly block			TCD 2012		2V	90 Nm	
A00 003	Mounting feet/engine mounting on crankcase			TCD 2012		2V	95 \pm_{-10}^{+10} Nm	
A01 001	Cylinder head on crankcase		Note tightening order. Lightly oil screws. Use 3 times with written proof, otherwise use new screws every time they are loosened.	TCD 2012		2V	30 Nm	80 Nm
								+90°
A01 002	Rocker arm bracket on cylinder head	Cylinder head screw	Installation advice: rocker arm symmetrical to the valve center axles, see A01 001	TCD 2012		2V	30 Nm	
A01 003	Lock nut valve clearance setting screw			TCD 2012		2V	20 \pm_{-2}^{+2} Nm	
A01 004	Cylinder head cover on cylinder head	M6		TCD 2012		2V	13 Nm	
A01 011	Exhaust return module on cylinder head		Observe tightening sequence	TCD 2012		2V	10 Nm	30 Nm
A01 012	Lock nut setting screw exhaust return module			TCD 2012		2V	20 \pm_{-2}^{+2} Nm	
A01 013	Solenoid valve (exhaust return line) on cylinder head			TCD 2012		2V	24 Nm	
A01 016	Locking screw on cylinder head	M14x12	Renew sealing ring	TCD 2012		2V	34 Nm	
A02 010	Main bearing on crankcase		Can be used 3 times with written proof, otherwise use new screws every time they are loosened.	TCD 2012		2V	50 Nm	+60°
A02 020	Con rod bearing cover on con rod		Use new screws every time they are loosened.	TCD 2012		2V	30 Nm	+60°
A03 020	Front cover on crankcase		Wet rotors with engine oil before installing.	TCD 2012		2V	3 Nm	21 Nm

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A03 030	Oil tray on crankcase		Observe tightening sequence	TCD 2012		2V	30 Nm	
A03 031	Locking screw on oil tray (aluminum or sheet steel)	M18x1.5	Cu sealing ring	TCD 2012		2V	55 Nm	
A03 060	Crankcase ventilation on cylinder head			TCD 2012		2V	21 Nm	
A03 062	Return line to return stop valve	Hollow screw		TCD 2012		2V	30^{+3}_{-3} Nm	
A03 063	Return stop valve on crankcase			TCD 2012		2V	80^{+8}_{-8} Nm	
A03 065	Hold oil return line (pipe clip)			TCD 2012		2V	30 Nm	
A03 080	Connection housing to crankcase	M12x80 mm	Observe tightening sequence	TCD 2012		2V	99 Nm	
		M12x150 mm						
A03 082	Connection housing to crankcase	M16x75	Observe tightening sequence	TCD 2012		2V	243 Nm	
		M16x140 mm						
A03 085	Cover plate to connection housing			TCD 2012		2V	8.5 Nm	
A03 091	Gearcase on crankcase	M16x60-10.9	Observe tightening sequence	TCD 2012		2V	70^{+5}_{-5} Nm	
A03 092	Gearcase on crankcase	M8x35-10.9	Observe tightening sequence	TCD 2012		2V	30^{+3}_{-3} Nm	
		M8x45-10.9						
		M8x50-10.9						
A04 022	Cap on gearcase			TCD 2012		2V	21 Nm	
A05 011	Impulse transmitter (crankshaft) on holder on front cover			TCD 2012		2V	9 Nm	
A05 012	Impulse transmitter (camshaft) on gearcase			TCD 2012		2V	9 Nm	
A05 013	Holder impulse transmitter (crankshaft) on front cover			TCD 2012		2V	9 Nm	
A06 001	Exhaust manifold on cylinder head		Observe tightening sequence	TCD 2012		2V	25 Nm	
A06 020	Turbocharger on exhaust manifold			TCD 2012		2V	42 Nm	

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A06 030	Charge air line on cylinder head			TCD 2012		2V	13 Nm	
A06 042	Heating flange on charge air manifold			TCD 2012		2V	30 Nm	
A06 046	Charge air manifold on charge air pipe	M8x30-10.9		TCD 2012		2V	30 Nm	
		M8x95-10.9						
A06 047	Hose nozzle on charge air manifold	M8x30-10.9		TCD 2012		2V	30 Nm	
A07 001	Clamping shoe injector on cylinder head		Observe assembly sequence Install injector tension-free	TCD 2012		2V	16 ⁺⁵ Nm	
A07 003	Injection lines on rail and injector, High-pressure line on high-pressure pump		Assembly specification	TCD 2012		2V	25 Nm	
A07 024	Fuel supply pump on holder			TCD 2012		2V	22 ⁺² ₋₂ Nm	
A07 025	Holder fuel supply pump on holder			TCD 2012		2V	30 Nm	
A07 026	V-belt pulley on fuel supply pump		Use new screws every time they are loosened.	TCD 2012		2V	27 ⁺² ₋₂ Nm	
A07 031	High-pressure pump on crankcase	M10x30		TCD 2012		2V	10 Nm	50 Nm
A07 032	Control block on crankcase			TCD 2012		2V	30 Nm	
A07 034	Fuel pipe on high-pressure pump			TCD 2012		2V	29 Nm	
A07 035	Fuel pipe on control block			TCD 2012		2V	39 Nm	
A07 038	Rail on cylinder head		All injection lines 27.5 Nm	TCD 2012		2V	30 Nm	
A07 039	Pressure limiting valve on rail		insert with assembly grease	TCD 2012		2V	100 Nm	
A07 040	Rail pressure sensor on rail		insert with assembly grease	TCD 2012		2V	70 Nm	
A07 044	Pipe clips, fuel line fastening			TCD 2012		2V	30 Nm	
A07 045	Fuel line (supply) on control block Fuel line (supply) on fuel filter console Fuel line (return) on rail	Hollow screw		TCD 2012		2V	39 Nm	

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A07 046	Fuel pipe (return) on control block	Hollow screw		TCD 2012		2V	49 Nm	
A07 047	Fuel line (return) on cylinder head	Hollow screw		TCD 2012		2V	29 Nm	
A07 084	Fuel line on fuel filter	Hollow screw		TCD 2012		2V	39 Nm	
A07 087	Fuel filter console/radiator tank on crankcase			TCD 2012		2V	30 Nm	
A07 090	Fuel pressure sensor on fuel filter console			TCD 2012		2V	30 \pm 5 Nm	
A07 094	Screw-in nipple on fuel filter console	M24x16		TCD 2012		2V	60 \pm 5 Nm	
A07 099	Fuel filter on fuel filter console						Hand tighten	
A08 001	Oil filter/beaker filter			TCD 2012		2V	25 Nm	
	Oil filter/interchangeable filter		Lightly oil gasket / tighten well by hand				Hand tighten	
A08 015	Oil suction intake pipe on oil pump			TCD 2012		2V	30 Nm	
A08 040	Lube oil line on turbocharger/crankcase	Hollow screw		TCD 2012		2V	39 Nm	
A08 044	Pipe union (oil return) on turbocharger			TCD 2012		2V	20 Nm	
A08 045	Pipe clip on oil return and lube oil line			TCD 2012		2V	20 Nm	
A08 046	Retainer clip (oil return) on crankcase Oil return line holder			TCD 2012		2V	20 Nm	
A08 051	Oil cooler housing on crankcase			TCD 2012		2V	30 Nm	
A08 052	Oil cooler on oil cooler housing		Insert O-rings with fitting compound.	TCD 2012		2V	22 \pm 2 Nm	
A08 091	Oil pressure switch on oil cooler housing			TCD 2012		2V	20 Nm	
A09 001	Thermostat housing on cylinder head			TCD 2012		2V	60 Nm	
A09 002	Discharge nozzle on thermostat housing/fan console			TCD 2012		2V	21 Nm	

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clam- ping value	Post- clamping value
A09 010	Coolant pump on fan console			TCD 2012		2V	30 Nm	
A09 015	V-rib belt pulley on coolant pump			TCD 2012		2V	30 Nm	
A09 031	Temperature sensor on cylinder head			TCD 2012		2V	24 Nm	
A09 045	Fan console on crankcase			TCD 2012		2V	30 Nm	
A09 046	Fan drive on fan console			TCD 2012		2V	60 Nm	
A09 047	V-rib belt pulley on fan drive	M12x85-12.9		TCD 2012		2V	30 Nm	+90 °
A09 048	Adapter on V-rib belt pulley			TCD 2012		2V	30 Nm	
A12 001	Flywheel on crankcase	M10x30	Use new screws every time they are loosened.	TCD 2012		2V	30 Nm	+60 ° +30 °
		M10x35 M10x40 M10x45 M10x50 M10x55 M10x60 M10x70 M10x75 M10x80 M10x85					30 Nm	+60 °+60 °
A12 030	Torsional vibration damper/V-rib belt pulley on crankshaft	M16x1.5	Use new screws every time they are loosened.	TCD 2012		2V	40 ⁺¹⁰ Nm	+60 ° +60 °
A12 031	V-belt pulley on V-rib belt pulley	M12x25-10.9	Use new screws every time they are loosened.	TCD 2012		2V	130 Nm	
		M10x20-10.9					70 Nm	
A12 032	Flange hub for visco-coupling on torsional vibration damper	M12x40-10.9					110 Nm	
A12 041	Belt tensioner on fan console			TCD 2012		2V	80 Nm	
A12 091	Hollow screw pipe union	M10x1	Ring piece pipe 6 mm	TCD 2012		2V	29 Nm	

ID no.	Designation	Screw type	Notes / Remarks	Series			Pre-clamping value	Post-clamping value
A12 092	Hollow screw pipe union	M12x1.5	Ring piece pipe 8 mm	TCD 2012		2V	39 Nm	
A12 093	Hollow screw pipe union	M14x1.5	Ring piece pipe 10 mm	TCD 2012		2V	49 Nm	
A12 095	Pipe clip, fastening wiring harness			TCD 2012		2V	30 Nm	
	Pipe clip for return line	M6					13 \pm 1 Nm	
A13 001	Starter on gearcase cover			TCD 2012		2V	70 Nm	
A13 007	Cooling air baffle on starter	M8x30		TCD 2012		2V	30 Nm	
		M8x50						
		M8						
A13 012	Generator on console (V-rib belt)	M10x75-10.9 M10x100-10.9		TCD 2012		2V	60 Nm	
	Generator on console (V-belt)						42 Nm	
A13 018	Generator console on cylinder head (V-rib belt)	M10x100-10.9		TCD 2012		2V	70 Nm	
	Generator console on cylinder head (V-belt)						30 Nm	
A13 032	Heating plug/locking screw on cylinder head			TCD 2012		2V	20 \pm 2 Nm	
A13 041	Cover plate on cylinder head cover	M6x12		TCD 2012		2V	30 Nm	
A13 046	Pressure/temperature sensor on suction air intake pipe (charge air)			TCD 2012		2V	5 Nm	
A13 051	Cable connection on injector			TCD 2012		2V	1.5 Nm	
A13 074	Oil level sensor on oil tray			TCD 2012		2V	110 Nm	



TCD 2012 2V

**Technical data
Tightening specifications**

5 Job card overview

5.1 Sorted alphabetically



Activity	Job card	Maintenance group
Checking the camshaft	W 04-05-06	Engine control
Checking the compression pressure	W 00-02-06	General
Checking the con rod	W 02-03-01	Drive system
Checking the coolant thermostat, in the removed state	W 09-08-01	Cooling system
Checking the crankshaft	W 02-01-07	Drive system
Checking the cylinders	W 03-03-01	Crankcase
Checking the piston	W 02-09-07	Drive system
Checking the piston rings and piston ring grooves	W 02-10-03	Drive system
Checking the valve guide	W 01-06-03	Cylinder head
Checking the valve lag	W 01-07-08	Cylinder head
Checking the valves	W 01-05-04	Cylinder head
Disassembling, assembling and checking the rocker arm and rocker arm bracket	W 01-02-06	Cylinder head
Dismantling and assembling the fan drive	W 09-13-01	Cooling system
Installing and removing the fan drive	W 09-13-02	Cooling system
Mounting and dismantling the engine on the assembly block	W 00-05-01	General
Removing and installing the fuel filter console	W 07-10-08	Fuel system
Removing and installing rocker arms and rocker arm brackets	W 01-02-02	Cylinder head
Removing and installing the belt tensioner (V-rib belt)	W 12-02-06	Other components
Removing and installing the cable harness	W 13-01-02	Electrical system
Removing and installing the camshaft	W 04-05-05	Engine control
Removing and installing the charge air line	W 06-07-03	Exhaust system / Charging
Removing and installing the connection housing	W 03-09-04	Crankcase
Removing and installing the control block	W 07-15-01	Fuel system
Removing and installing the coolant pump (V-rib belt drive)	W 09-07-08	Cooling system
Removing and installing the coolant temperature sensor	W 09-12-01	Cooling system
Removing and installing the coolant thermostat	W 09-08-02	Cooling system
Removing and installing the crankcase bleeding	W 03-01-11	Crankcase
Removing and installing the crankshaft	W 02-04-01	Drive system
Removing and installing the cylinder head	W 01-04-04	Cylinder head
Removing and installing the exhaust manifold	W 06-01-05	Exhaust system / Charging
Removing and installing the exhaust return module	W 06-09-01	Exhaust system / Charging

Activity	Job card	Maintenance group
Removing and installing the fan console	W 09-13-03	Cooling system
Removing and installing the flywheel	W 12-06-01	Other components
Removing and installing the front cover (opposite side to flywheel)	W 03-08-01	Crankcase
Removing and installing the fuel pressure sensor	W 07-15-18	Fuel system
Removing and installing the fuel supply pump (V-rib belt drive)	W 07-11-01	Fuel system
Removing and installing the gearcase	W 04-04-09	Engine control
Removing and installing the generator (V-rib belt drive)	W 13-02-03	Electrical system
Removing and installing the heating plugs	W 13-06-01	Electrical system
Removing and installing the high-pressure pump (installation position A)	W 07-15-04	Fuel system
Removing and installing the high-pressure pump (installation position B)	W 07-15-05	Fuel system
Removing and installing the injector	W 07-15-11	Fuel system
Removing and installing the lube oil tray	W 08-04-07	Lube oil system
Removing and installing the oil cooler	W 08-08-02	Lube oil system
Removing and installing the oil cooler housing	W 08-08-03	Lube oil system
Removing and installing the oil filter cartridge	W 08-10-06	Lube oil system
Removing and installing the oil pressure switch	W 08-11-09	Lube oil system
Removing and installing the oil suction intake pipe	W 08-04-06	Lube oil system
Removing and installing the piston and con rod.	W 02-09-03	Drive system
Removing and installing the piston cooling nozzles	W 02-15-01	Drive system
Removing and installing the pressure limiting valve	W 07-15-14	Fuel system
Removing and installing the pressure/temperature sensor (charge air)	W 13-08-01	Electrical system
Removing and installing the rail	W 07-15-08	Fuel system
Removing and installing the rail pressure sensor	W 07-15-16	Fuel system
Removing and installing the solenoid valve exhaust return line	W 06-09-02	Exhaust system / Charging
Removing and installing the speed governor (camshaft)	W 05-07-03	Speed governing
Removing and installing the speed governor (crankshaft)	W 05-07-01	Speed governing
Removing and installing the starter	W 13-03-02	Electrical system
Removing and installing the torsional vibration damper (V-rib belt drive)	W 12-01-04	Other components
Removing and installing the turbocharger	W 06-06-04	Exhaust system / Charging

Activity	Job card	Maintenance group
Removing and installing the valves	W 01-05-01	Cylinder head
Removing and installing the water cistern	W 09-06-01	Cooling system
Renewing the crankshaft sealing ring (flywheel side)	W 02-02-02	Drive system
Renewing the crankshaft sealing ring (opposite side to flywheel)	W 02-02-04	Drive system
Setting the valve clearance (with installed exhaust return module)	W 01-01-01	Cylinder head
Setting the valve clearance (without or with removed exhaust return module)	W 01-01-01	Cylinder head



5.2 Sorted numerically



5

Job card	Activity	Maintenance group
W 00-02-06	Checking the compression pressure	General
W 00-05-01	Mounting and dismounting the engine on the assembly block	General
W 01-01-01	Setting the valve clearance (with installed exhaust return module)	Cylinder head
W 01-01-01	Setting the valve clearance (without or with removed exhaust return module)	Cylinder head
W 01-02-02	Removing and installing rocker arms and rocker arm brackets	Cylinder head
W 01-02-06	Disassembling, assembling and checking the rocker arm and rocker arm bracket	Cylinder head
W 01-04-04	Removing and installing the cylinder head	Cylinder head
W 01-05-01	Removing and installing the valves	Cylinder head
W 01-05-04	Checking the valves	Cylinder head
W 01-06-03	Checking the valve guide	Cylinder head
W 01-07-08	Checking the valve lag	Cylinder head
W 02-01-07	Checking the crankshaft	Drive system
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)	Drive system
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)	Drive system
W 02-03-01	Checking the con rod	Drive system
W 02-04-01	Removing and installing the crankshaft	Drive system
W 02-09-03	Removing and installing the piston and con rod.	Drive system
W 02-09-07	Checking the piston	Drive system
W 02-10-03	Checking the piston rings and piston ring grooves	Drive system
W 02-15-01	Removing and installing the piston cooling nozzles	Drive system
W 03-01-11	Removing and installing the crankcase bleeding	Crankcase
W 03-03-01	Checking the cylinders	Crankcase
W 03-08-01	Removing and installing the front cover (opposite side to flywheel)	Crankcase
W 03-09-04	Removing and installing the connection housing	Crankcase
W 04-04-09	Removing and installing the gearcase	Engine control
W 04-05-05	Removing and installing the camshaft	Engine control
W 04-05-06	Checking the camshaft	Engine control
W 05-07-01	Removing and installing the speed governor (crankshaft)	Speed governing
W 05-07-03	Removing and installing the speed governor (camshaft)	Speed governing
W 06-01-05	Removing and installing the exhaust manifold	Exhaust system / Charging

Job card	Activity	Maintenance group
W 06-06-04	Removing and installing the turbocharger	Exhaust system / Charging
W 06-07-03	Removing and installing the charge air line	Exhaust system / Charging
W 06-09-01	Removing and installing the exhaust return module	Exhaust system / Charging
W 06-09-02	Removing and installing the solenoid valve exhaust return line	Exhaust system / Charging
W 07-10-08	Removing and installing the fuel filter console	Fuel system
W 07-11-01	Removing and installing the fuel supply pump (V-rib belt drive)	Fuel system
W 07-15-01	Removing and installing the control block	Fuel system
W 07-15-04	Removing and installing the high-pressure pump (installation position A)	Fuel system
W 07-15-05	Removing and installing the high-pressure pump (installation position B)	Fuel system
W 07-15-08	Removing and installing the rail	Fuel system
W 07-15-11	Removing and installing the injector	Fuel system
W 07-15-14	Removing and installing the pressure limiting valve	Fuel system
W 07-15-16	Removing and installing the rail pressure sensor	Fuel system
W 07-15-18	Removing and installing the fuel pressure sensor	Fuel system
W 08-04-06	Removing and installing the oil suction intake pipe	Lube oil system
W 08-04-07	Removing and installing the lube oil tray	Lube oil system
W 08-08-02	Removing and installing the oil cooler	Lube oil system
W 08-08-03	Removing and installing the oil cooler housing	Lube oil system
W 08-10-06	Removing and installing the oil filter cartridge	Lube oil system
W 08-11-09	Removing and installing the oil pressure switch	Lube oil system
W 09-06-01	Removing and installing the water cistern	Cooling system
W 09-07-08	Removing and installing the coolant pump (V-rib belt drive)	Cooling system
W 09-08-01	Checking the coolant thermostat, in the removed state	Cooling system
W 09-08-02	Removing and installing the coolant thermostat	Cooling system
W 09-12-01	Removing and installing the coolant temperature sensor	Cooling system
W 09-13-01	Dismantling and assembling the fan drive	Cooling system
W 09-13-02	Installing and removing the fan drive	Cooling system
W 09-13-03	Removing and installing the fan console	Cooling system
W 12-01-04	Removing and installing the torsional vibration damper (V-rib belt drive)	Other components
W 12-02-06	Removing and installing the belt tensioner (V-rib belt)	Other components

Job card	Activity	Maintenance group
W 12-06-01	Removing and installing the flywheel	Other components
W 13-01-02	Removing and installing the cable harness	Electrical system
W 13-02-03	Removing and installing the generator (V-rib belt drive)	Electrical system
W 13-03-02	Removing and installing the starter	Electrical system
W 13-06-01	Removing and installing the heating plugs	Electrical system
W 13-08-01	Removing and installing the pressure/temperature sensor (charge air)	Electrical system



5.3 Job card references



00 General

Job card	Activity and additional job cards necessary for its execution				
W 00-02-06	Checking the compression pressure				
	W 01-01-01	W 01-01-01	W 07-15-11		
W 00-05-01	Mounting and dismounting the engine on the assembly block				

01 Cylinder head

Job card	Activity and additional job cards necessary for its execution				
W 01-01-01	Setting the valve clearance (with installed exhaust return module)				
	W 06-09-01				
W 01-01-01	Setting the valve clearance (without or with removed exhaust return module)				
	W 06-09-01				
W 01-02-02	Removing and installing rocker arms and rocker arm brackets				
	W 01-01-01	W 01-01-01	W 06-09-01		
W 01-02-06	Disassembling, assembling and checking the rocker arm and rocker arm bracket				
	W 01-02-02				
W 01-04-04	Removing and installing the cylinder head				
	W 01-01-01	W 01-01-01	W 01-02-02	W 06-01-05	W 06-07-03
	W 06-09-01	W 06-09-02	W 07-15-08	W 09-13-03	W 13-06-01
W 01-05-01	Removing and installing the valves				
	W 01-04-04				
W 01-05-04	Checking the valves				
	W 01-05-01				
W 01-06-03	Checking the valve guide				
	W 01-05-01				
W 01-07-08	Checking the valve lag				
	W 01-04-04				

02 Drive system

Job card	Activity and additional job cards necessary for its execution				
W 02-01-07	Checking the crankshaft				
	W 02-04-01				
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)				
	W 12-06-01				

02 Drive system (Forts.)

Job card	Activity and additional job cards necessary for its execution				
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)				
	W 12-01-04				
W 02-03-01	Checking the con rod				
W 02-04-01	Removing and installing the crankshaft				
	W 02-01-07	W 03-08-01	W 04-04-09		
W 02-09-03	Removing and installing the piston and con rod.				
	W 01-04-04	W 02-10-03	W 08-04-06		
W 02-09-07	Checking the piston				
	W 02-09-03				
W 02-10-03	Checking the piston rings and piston ring grooves				
	W 02-09-03				
W 02-15-01	Removing and installing the piston cooling nozzles				
	W 02-04-01				

03 Crankcase

Job card	Activity and additional job cards necessary for its execution				
W 03-01-11	Removing and installing the crankcase bleeding				
W 03-03-01	Checking the cylinders				
	W 02-09-03				
W 03-08-01	Removing and installing the front cover (opposite side to flywheel)				
	W 02-02-04	W 08-04-06	W 12-01-04		
W 03-09-04	Removing and installing the connection housing				

04 Engine control

Job card	Activity and additional job cards necessary for its execution				
W 04-04-09	Removing and installing the gearcase				
	W 02-02-02	W 03-09-04	W 08-04-07	W 12-06-01	W 13-03-02
W 04-05-05	Removing and installing the camshaft				
	W 01-02-02	W 02-04-01	W 07-15-04	W 07-15-05	
W 04-05-06	Checking the camshaft				
	W 04-05-05				

05 Speed governing

Job card	Activity and additional job cards necessary for its execution				
W 05-07-01	Removing and installing the speed governor (crankshaft)				
W 05-07-03	Removing and installing the speed governor (camshaft)				

06 Exhaust system / Charging

Job card	Activity and additional job cards necessary for its execution				
W 06-01-05	Removing and installing the exhaust manifold				
	W 06-06-04				
W 06-06-04	Removing and installing the turbocharger				
W 06-07-03	Removing and installing the charge air line				
	W 13-08-01				
W 06-09-01	Removing and installing the exhaust return module				
W 06-09-02	Removing and installing the solenoid valve exhaust return line				
	W 09-12-01				

07 Fuel system

Job card	Activity and additional job cards necessary for its execution				
W 07-10-08	Removing and installing the fuel filter console				
	User notes				
W 07-11-01	Removing and installing the fuel supply pump (V-rib belt drive)				
	User notes				
W 07-15-01	Removing and installing the control block				
	User notes	W 07-15-08			
W 07-15-04	Removing and installing the high-pressure pump (installation position A)				
	User notes	W 07-15-01			
W 07-15-05	Removing and installing the high-pressure pump (installation position B)				
	User notes	W 07-15-01			
W 07-15-08	Removing and installing the rail				
	User notes				
W 07-15-11	Removing and installing the injector				
	User notes				

07 Fuel system (Forts.)

Job card	Activity and additional job cards necessary for its execution			
W 07-15-14	Removing and installing the pressure limiting valve			
	User notes			
W 07-15-16	Removing and installing the rail pressure sensor			
	User notes			
W 07-15-18	Removing and installing the fuel pressure sensor			
	User notes			

08 Lube oil system

Job card	Activity and additional job cards necessary for its execution			
W 08-04-06	Removing and installing the oil suction intake pipe			
	W 08-04-07			
W 08-04-07	Removing and installing the lube oil tray			
W 08-08-02	Removing and installing the oil cooler			
W 08-10-06	Removing and installing the oil filter cartridge			
W 08-08-03	Removing and installing the oil cooler housing			
	W 08-08-02	W 08-10-06		
W 08-11-09	Removing and installing the oil pressure switch			

09 Cooling system

Job card	Activity and additional job cards necessary for its execution			
W 09-06-01	Removing and installing the water cistern			
	W 07-10-08			
W 09-07-08	Removing and installing the coolant pump (V-rib belt drive)			
W 09-08-01	Checking the coolant thermostat, in the removed state			
	W 09-08-02			
W 09-08-02	Removing and installing the coolant thermostat			
W 09-12-01	Removing and installing the coolant temperature sensor			

09 Cooling system (Forts.)

Job card	Activity and additional job cards necessary for its execution				
W 09-13-01	Dismantling and assembling the fan drive				
	W 09-13-02				
W 09-13-02	Installing and removing the fan drive				
W 09-13-03	Removing and installing the fan console				
	W 07-11-01	W 09-13-02	W 12-02-06	W 13-02-03	

12 Other components

Job card	Activity and additional job cards necessary for its execution				
W 12-01-04	Removing and installing the torsional vibration damper (V-rib belt drive)				
	W 12-02-06				
W 12-02-06	Removing and installing the belt tensioner (V-rib belt)				
W 12-06-01	Removing and installing the flywheel				

13 Electrical system

Job card	Activity and additional job cards necessary for its execution				
W 13-01-02	Removing and installing the cable harness				
W 13-02-03	Removing and installing the generator (V-rib belt drive)				
W 13-03-02	Removing and installing the starter				
W 13-06-01	Removing and installing the heating plugs				
	W 07-15-11				
W 13-08-01	Removing and installing the pressure/temperature sensor (charge air)				

6 Job cards



Checking the compression pressure



Commercial available tools:

- Compression pressure tester..... 8005
- Torx tool set 8189

Special tools:

- Connector.....100 190



- W 01-01-01
- W 07-15-11

Checking the compression pressure

- Set the valve clearance (with exhaust return module installed).

 W 01-01-01

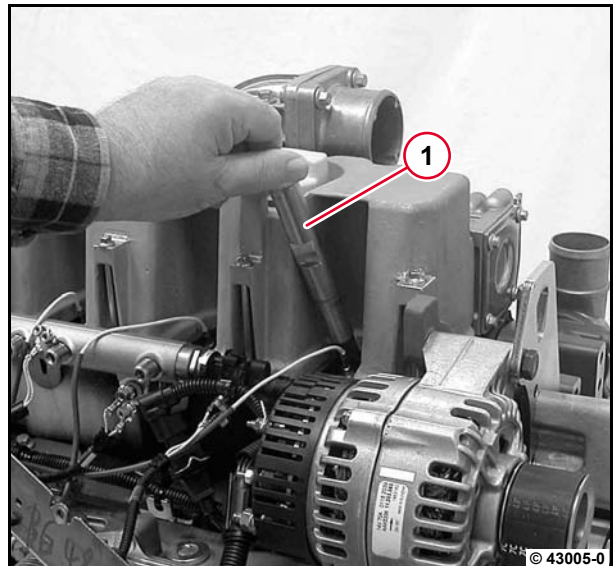
- Remove injectors.

 W 07-15-11

- Insert connector (1) with sealing ring.



Use sealing ring for injector.

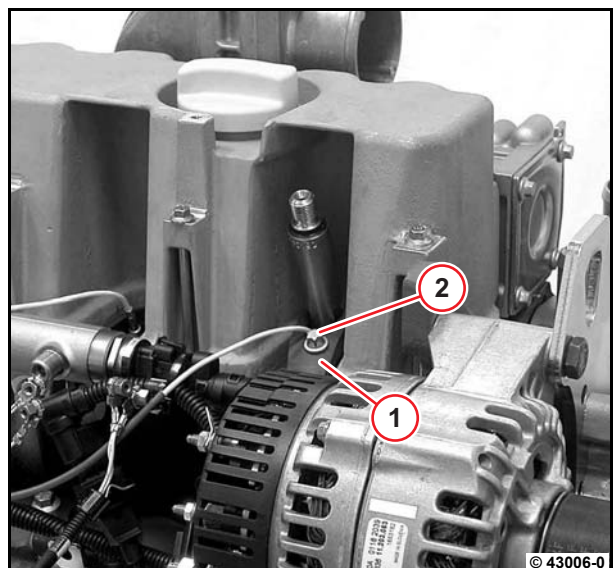


- Mount clamping shoe (1) and tighten screw (2).

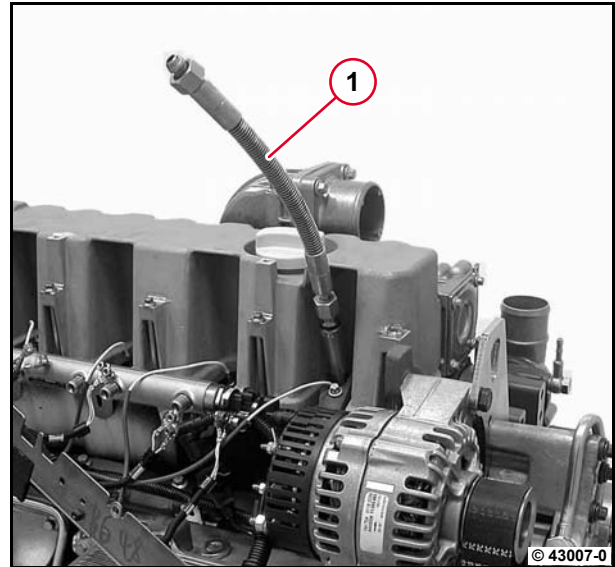
 A07 001



When installing the connector on cylinders 2 to 5, the clamping shoe must be inserted together with the connector.



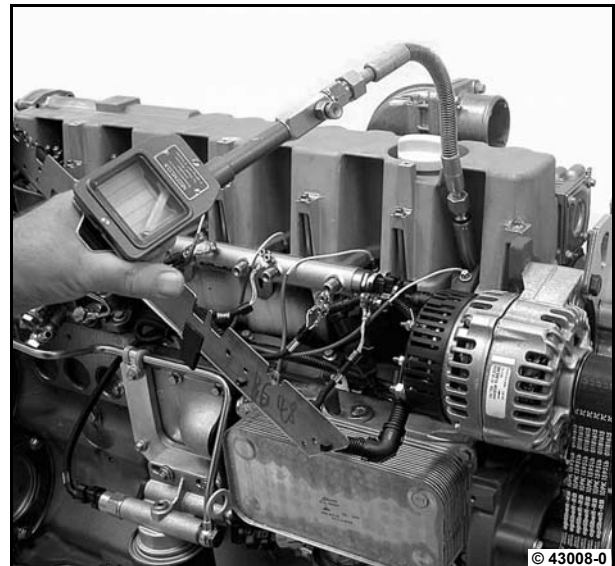
- If necessary, mount adapter (1) on connector.



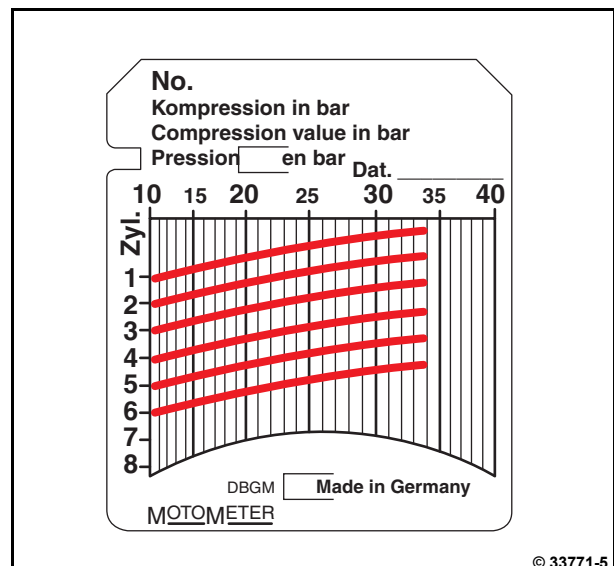
- Connect compression pressure tester to connector or adapter.
- Turn over engine with starter.



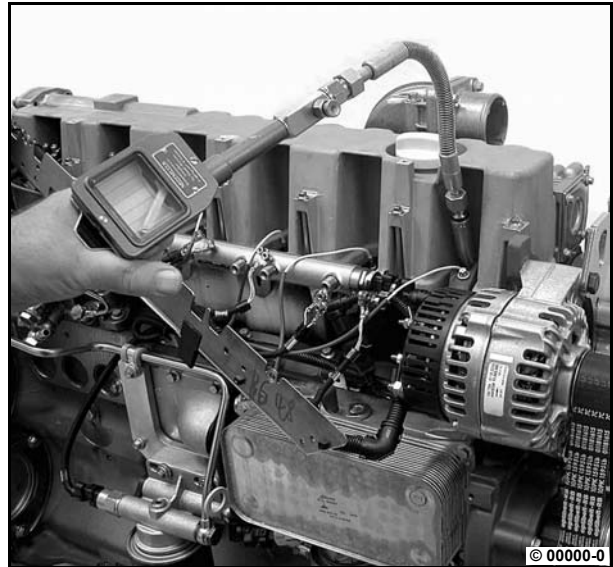
P00 51



The measured compression pressure depends on the starting speed during the measuring process and the altitude of the engine installation site. This means that limit values cannot be determined exactly. The compression pressure measurement is only recommended as a reference measurement of all cylinders of an engine to each other. If more than 15% deviation has been found, the cause should be determined by disassembling the cylinder unit concerned.

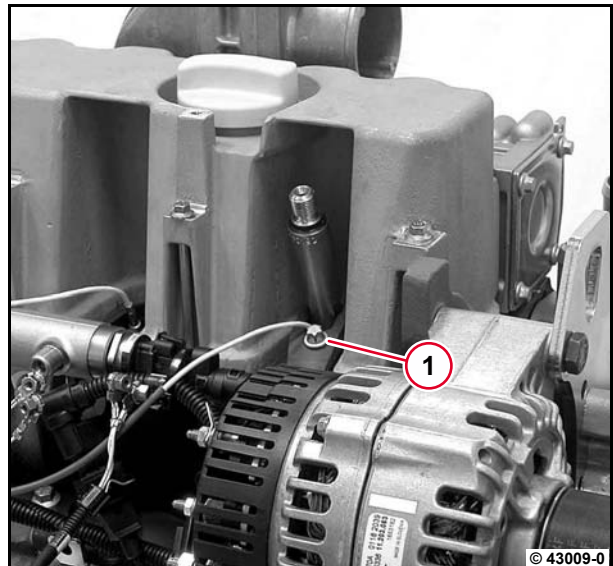


- Remove the compression tester and adapter.



- Unscrew screw (1) and remove clamping shoe.
- Remove connector and sealing ring.
- Install injector.

 [W 07-15-11](#)





Mounting engine on assembly block and demounting



Commercial available tools:

- Hoisting equipment
- Suspension ropes

Special tools:

- Assembly block incl. adapter plates 6066
- Clamping bracket 6066/158



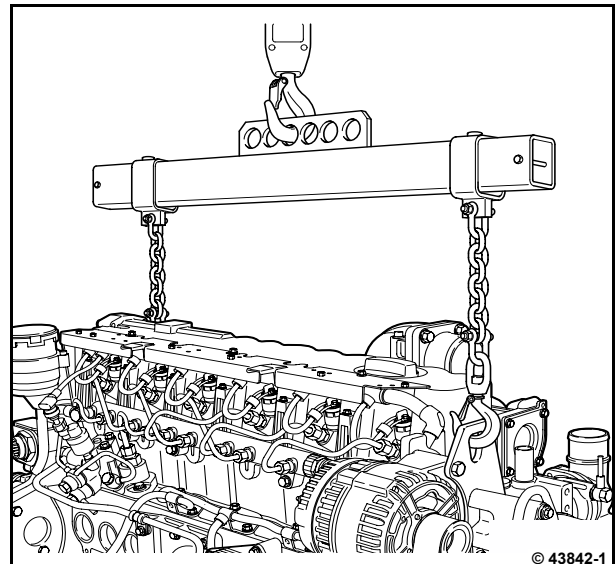
Different customer scopes are not taken into account in the repair sequence shown here, add-on parts which deviate from the standard equipment are not shown.

Mounting engine on assembly block

- Hang engine on suitable workshop crane.



P00 04

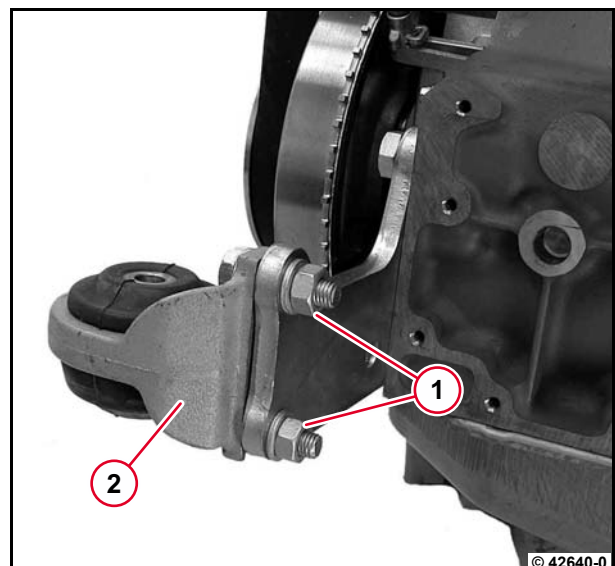


Remove mounting feet.

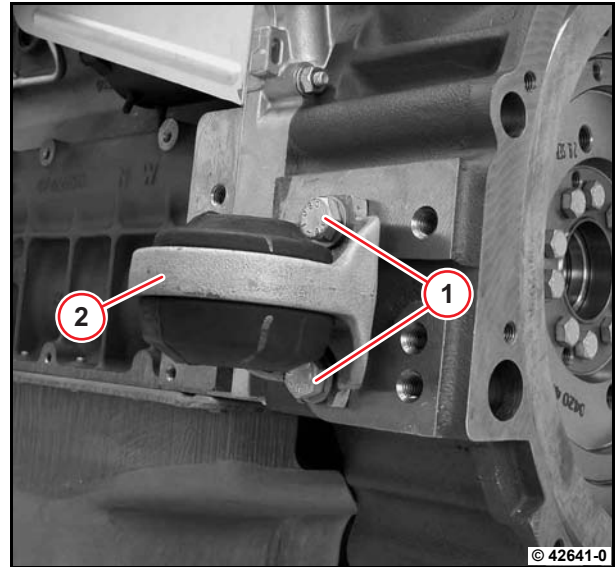
- Unscrew nuts (1) and remove mounting foot (2) from the holder.



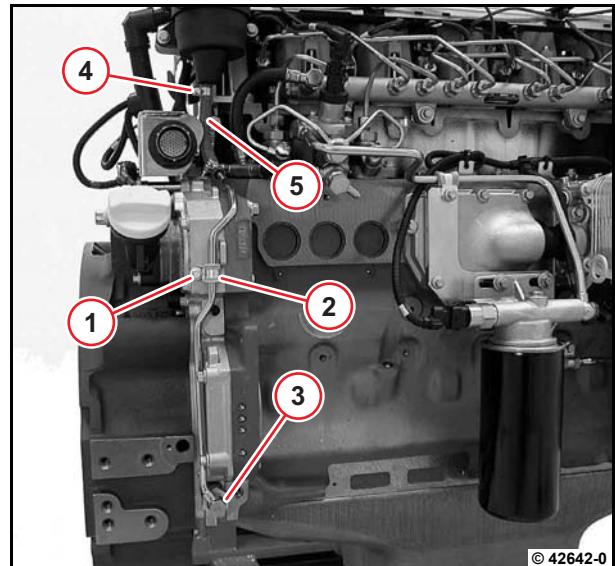
Remove all mounting feet.



- Unscrew screws (1) and remove mounting foot (2) from the connection housing.

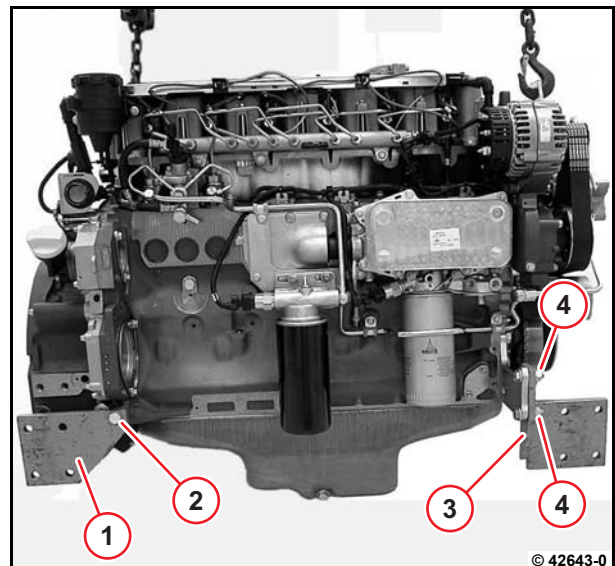


- Unscrew screw (1) and loosen pipe clip (2).
- Unscrew hollow screw (3) and remove sealing rings.
- Loosen hose clip (4).
- Pull the oil return line (5) off the crankcase ventilation and remove with ventilation duct.



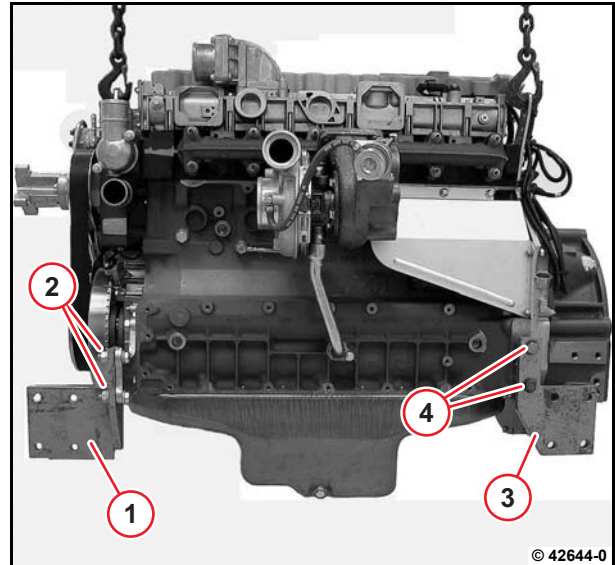
- Mount the clamping bracket 6066/158-3 (1) on the crankcase and tighten the screw (2).
- Mount the clamping bracket 6066/158-1 (3) on the holder and tighten the nuts (4).

 **A00 001**



- Mount the clamping bracket 6066/158-2 (1) on the holder and tighten the nuts (2).
- Mount the clamping bracket 6066/158-4 (3) on the crankcase and tighten the screws (4).

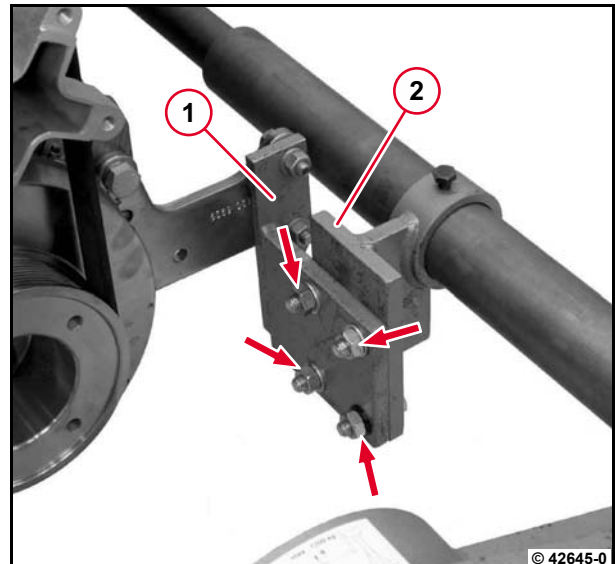
 A00 001



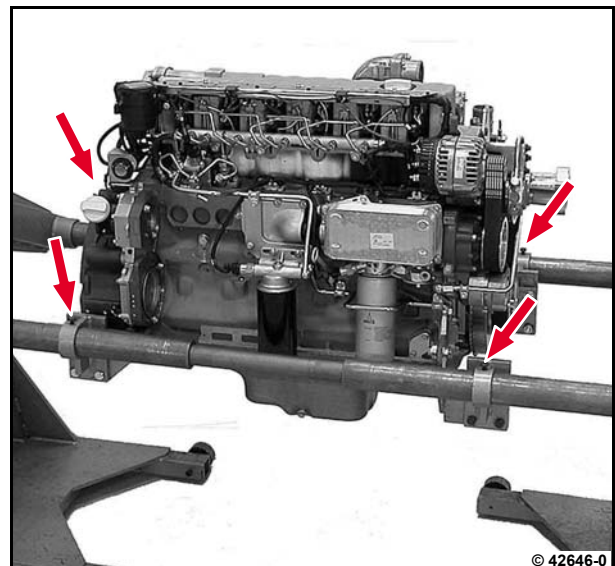
6

- Insert the engine with clamping brackets in the assembly block.
- Align all clamping brackets (1) on the adapter plates (2) of the assembly block.
- Insert screws and tighten nuts (arrows).

 A00 002

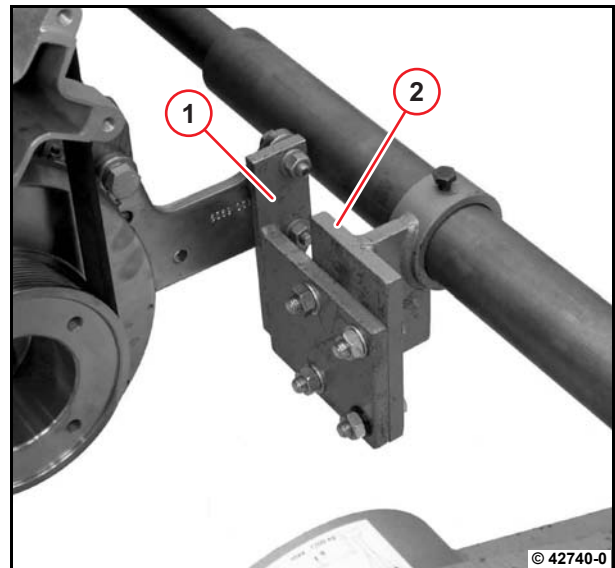


- Align the engine on the assembly block and tighten all screws (arrows).
- Unhook the engine from the workshop crane.

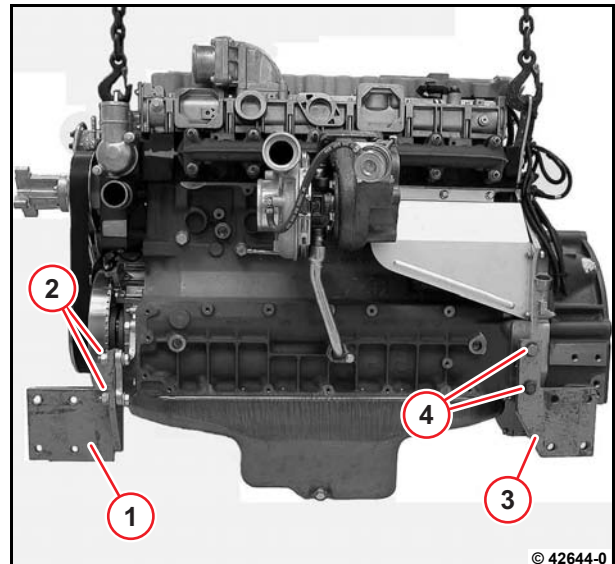


Dismounting engine from assembly block

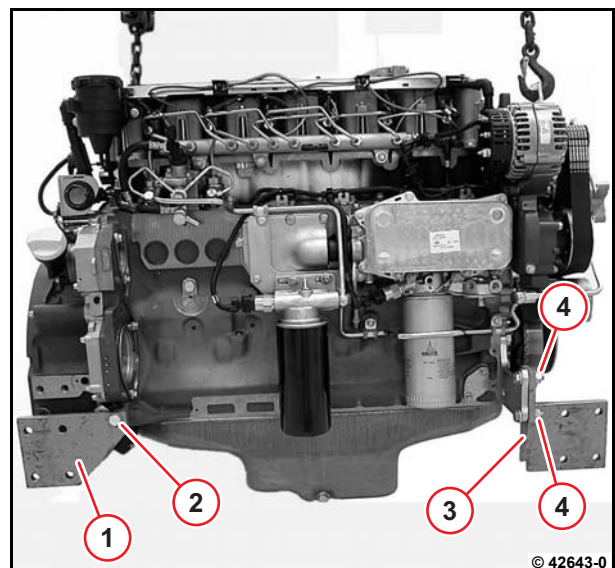
- Hang engine on suitable workshop crane.
- Remove all clamping brackets (1) from the adapter plates (2) of the assembly block.
- Lift engine off the assembly block



- Unscrew nuts (2), turn out screws (4) and remove clamping brackets (1 and 3).



- Unscrew nuts (4), remove screw (2) and remove clamping brackets (1 and 3).



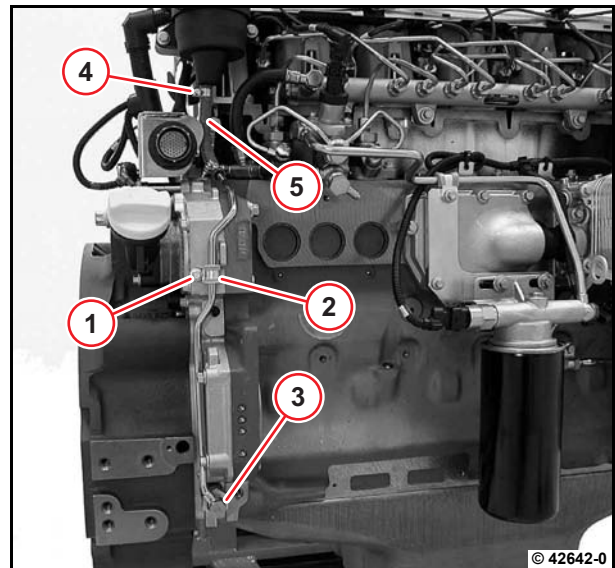
- Mount ventilation duct and attach oil return line (5).
- Tighten hollow screw (3) with new sealing rings.

 A12 091

- Position pipe clamp (2) and tighten screw (1).

 A12 095

- Position and fix hose clip (4).



6

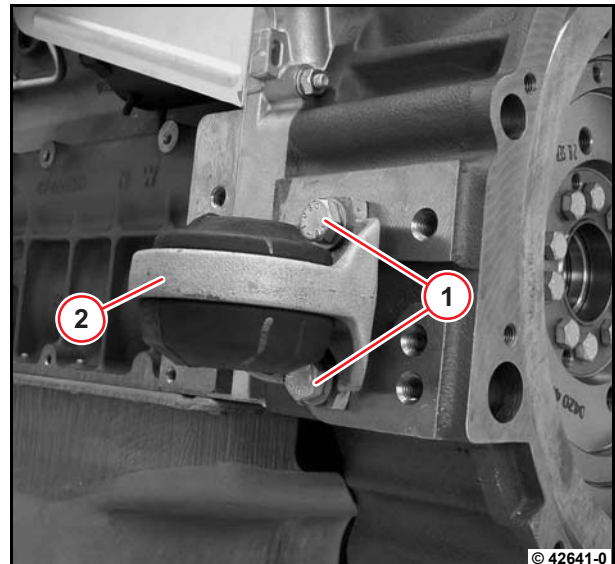
Mounting feet

- Mount foot (2) and tighten screws (1).

 A00 003



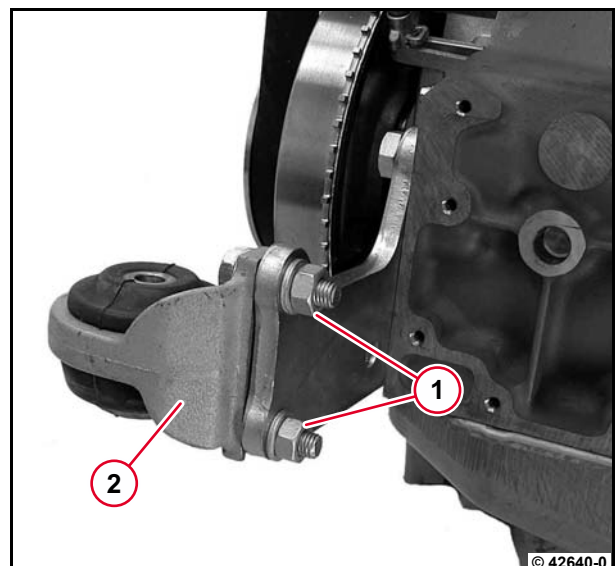
Mount all mounting feet.



- Mount foot (2) on holder and tighten nuts (1).

 A00 003

- Set down the engine and unhook it from the workshop crane.



Setting the valve clearance (with or without removal of exhaust return module)



Commercial available tools:

- Rotation angle disc 8190
- Open wrench size 13 8196
- Screwdriver insert for slot-
ted screws. 8191
- Screwdriver insert for
hexagon socket head
screws (4 mm) 8194

Special tools:

- Turning gear 100 320
- Socket wrench insert size
15 103 050



– W 06-09-01



Allow the engine to cool down for at least 30 minutes before setting the valve clearance.

Engine oil temperature < 80 °C.

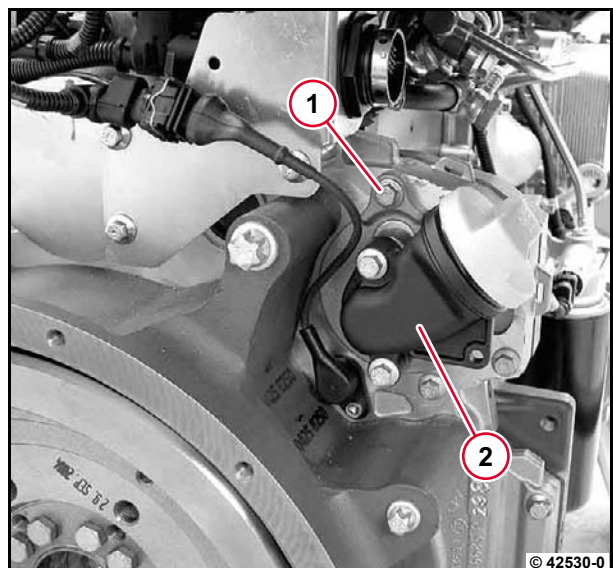
The control piston clearance of the exhaust return line must be set after setting the valve clearance.

In engines without an exhaust return module, a slotted adjusting screw must be installed in place of a hexagon socket head screw.

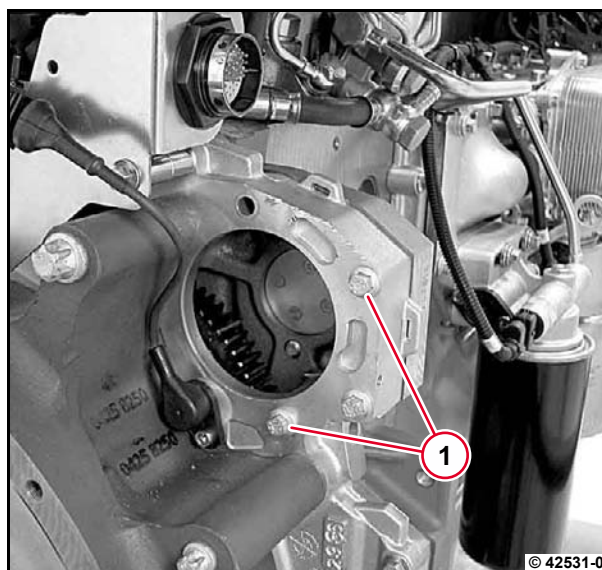
6

Disassembly

- Unscrew screw (1), remove cover (2) with oil filling nozzles.



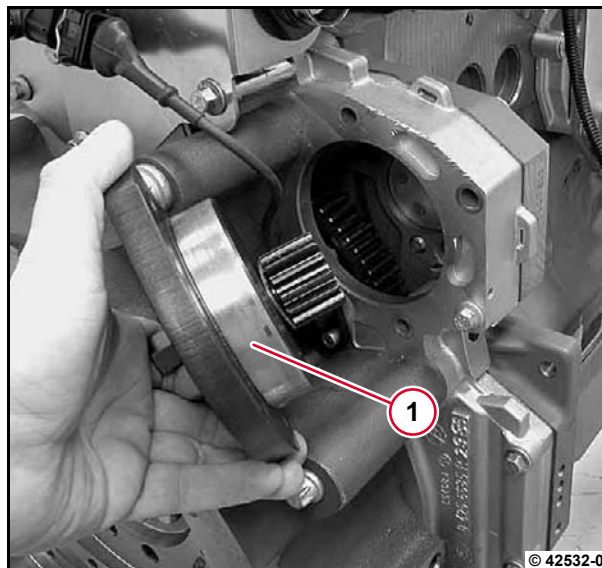
- Unscrew screws (1).



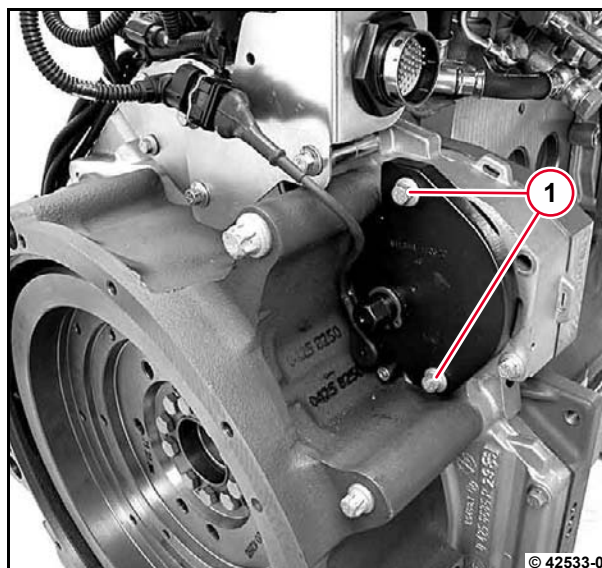
- Insert turning gear (1).



The gear wheel of the turning gear must grip into the teeth of the camshaft gear wheel.



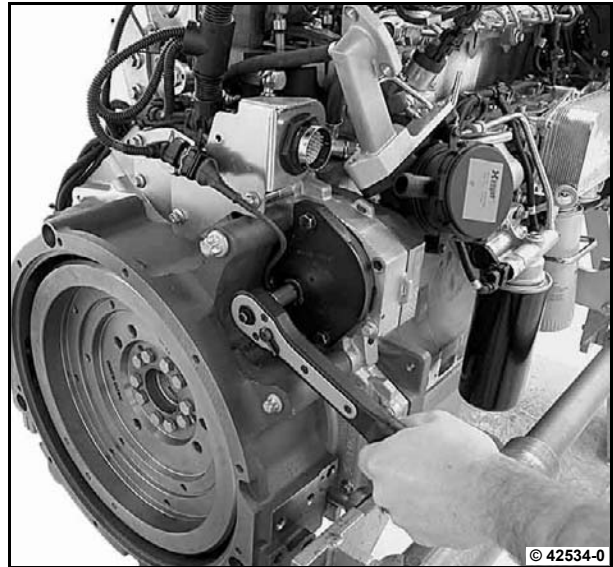
- Tighten screws (1).



Setting engine to valve overlap

- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.

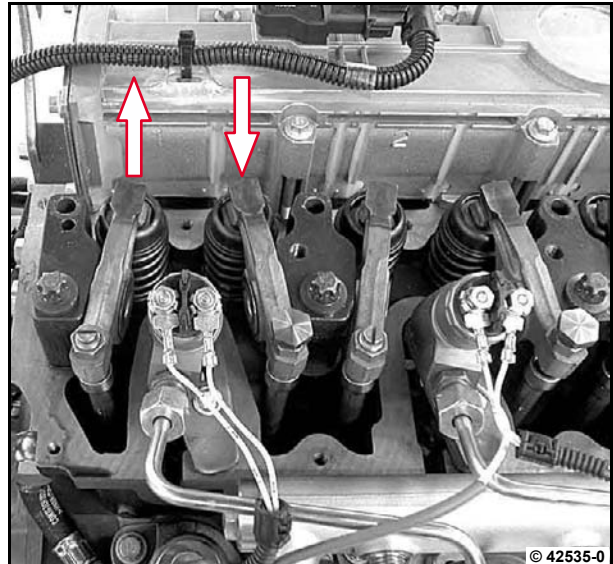
 P01 61



6



Valve overlap means:
Outlet valve is not yet closed. Inlet valve
begins to open.



Set valve clearance according to the setting schematic

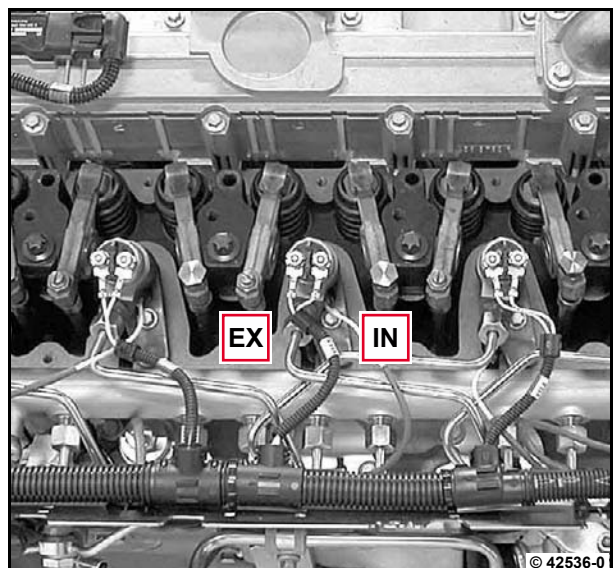
- Arrangement of the inlet and outlet valves.
IN = inlet valve EX = outlet valve

 A01 003



Attention!

Note design of the adjusting screw (with slot, wrench size or hexagon socket).



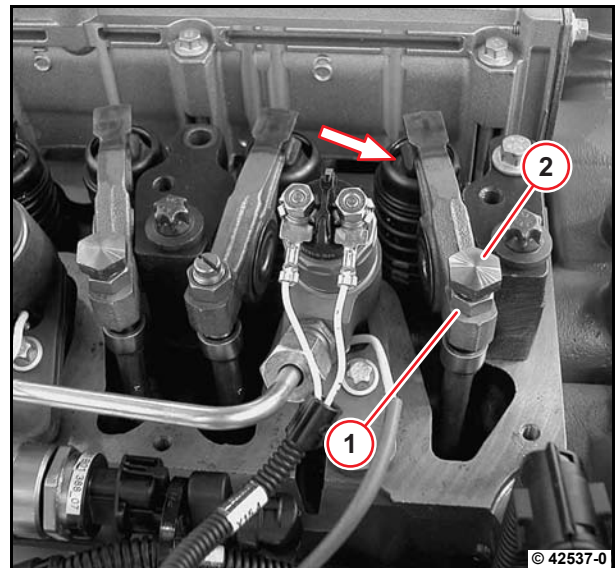
Setting the inlet valve clearance

- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



The rocker arm must touch the thrust washer of the spring cap (arrow).

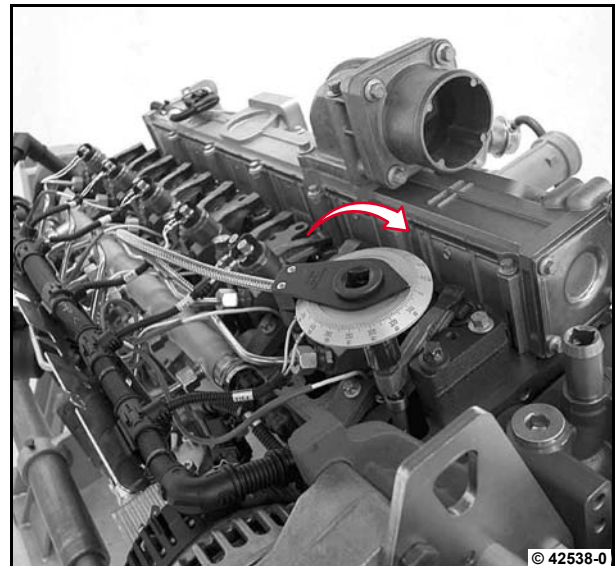
In engines without an exhaust return module, a slotted setting screw must be installed in place of a hexagon socket head screw.



- Set the rotation angle disc with a socket wrench insert at the setting screw.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.



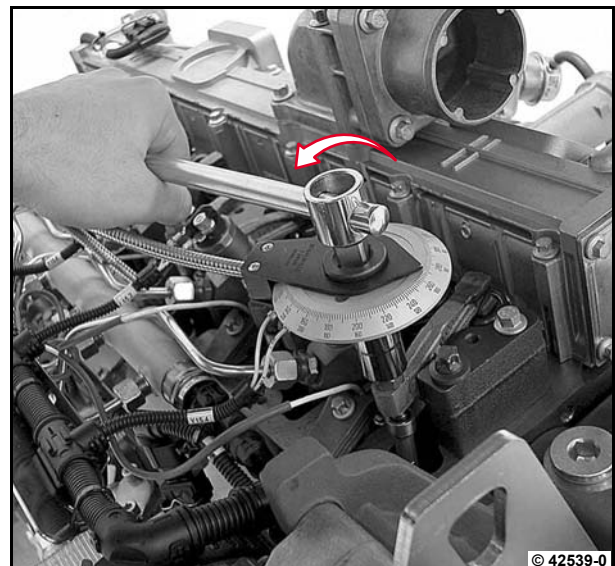
Be careful to turn the setting screw correctly.



- Turn the setting screw back in **in the direction of the arrow by 75°**.



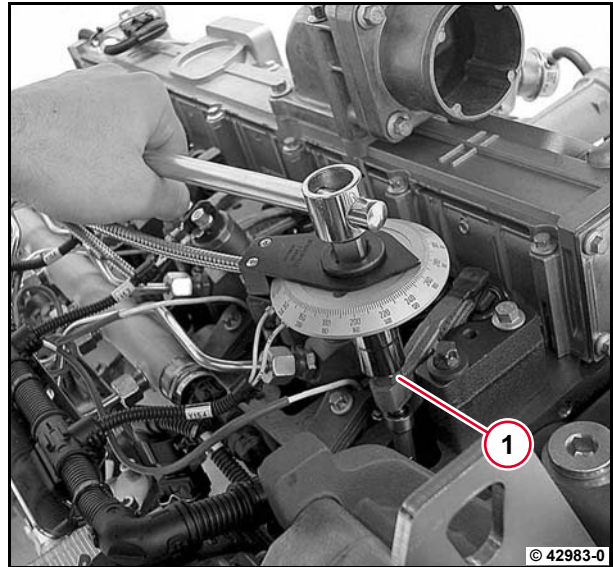
P01 62



- Hold the setting screw to prevent it turning and tighten the lock nut (1) with the open wrench.

 A01 003

- Remove rotation angle disc.



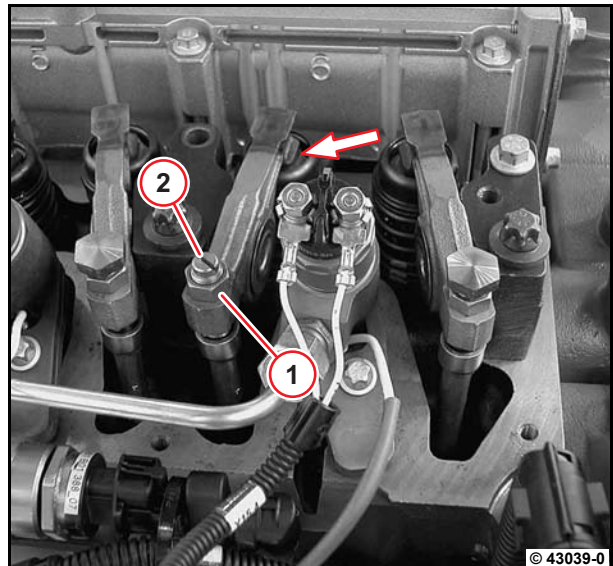
6

Setting the outlet valve clearance

- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



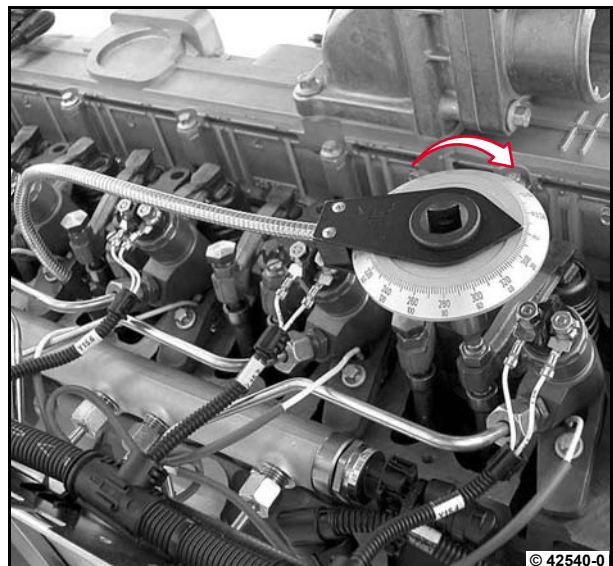
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the setting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.

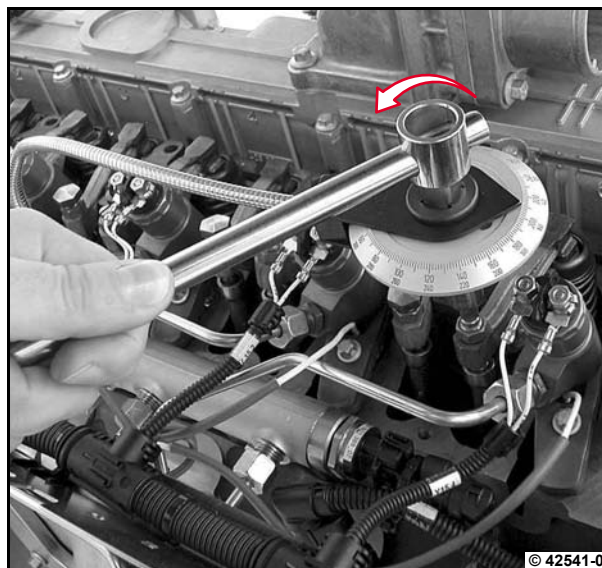


Be careful to turn the setting screw correctly.



- Turn the setting screw back by 120° in the direction of the arrow.

 P01 63



© 42541-0

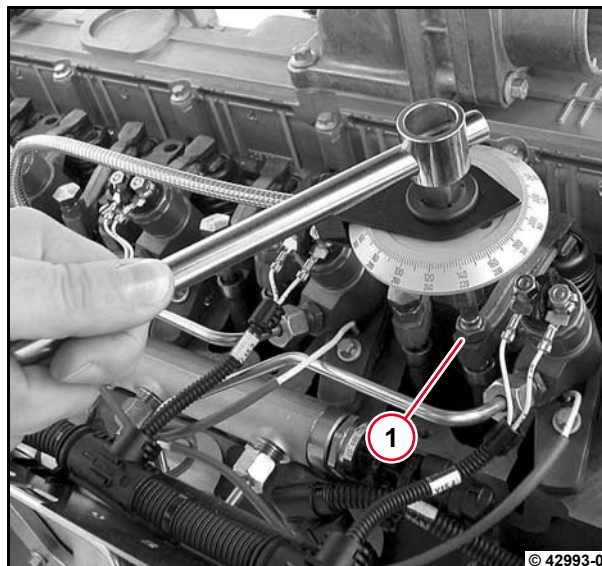
- Hold the setting screw to prevent it turning and tighten the lock nut (1) with the open wrench.

 P01 64

- Remove rotation angle disc.



Set all other valves according to the valve setting schematic T01 63.



© 42993-0

Setting the control piston clearance

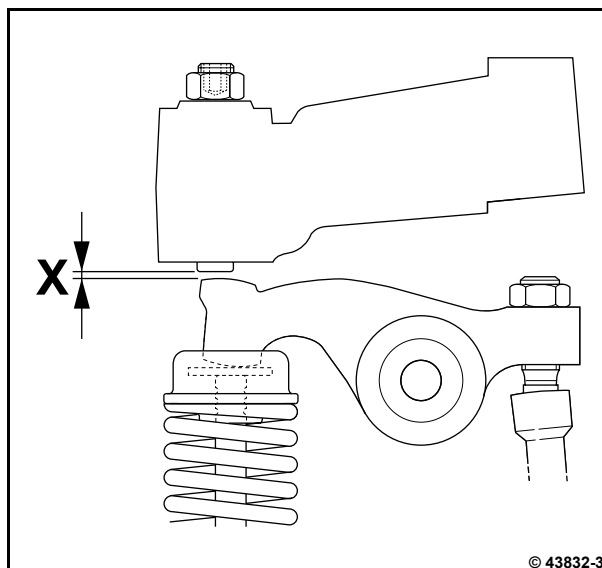
- Install exhaust return module.

 W 06-09-01



The control piston clearance (X) must be set after setting the valve clearance.

The setting sequence for the control piston clearance is identical with the valve setting schematic T01 63.

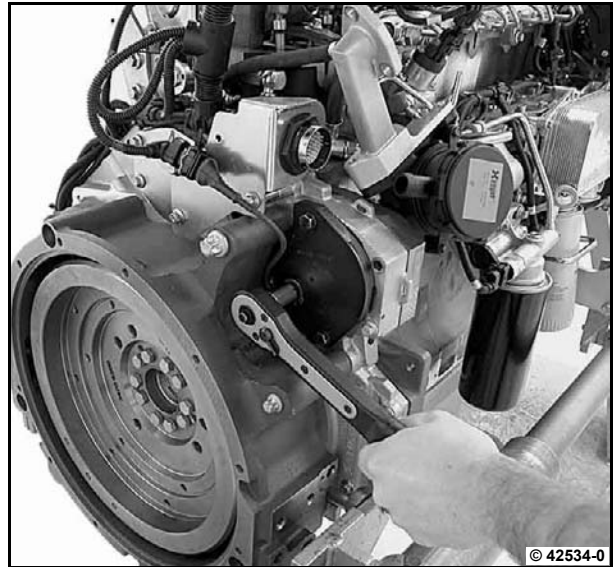


© 43832-3

Setting engine to valve overlap

- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.

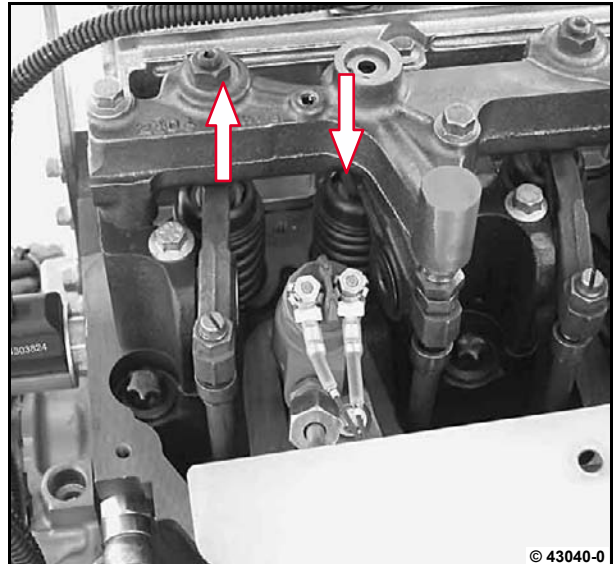
 A03 092



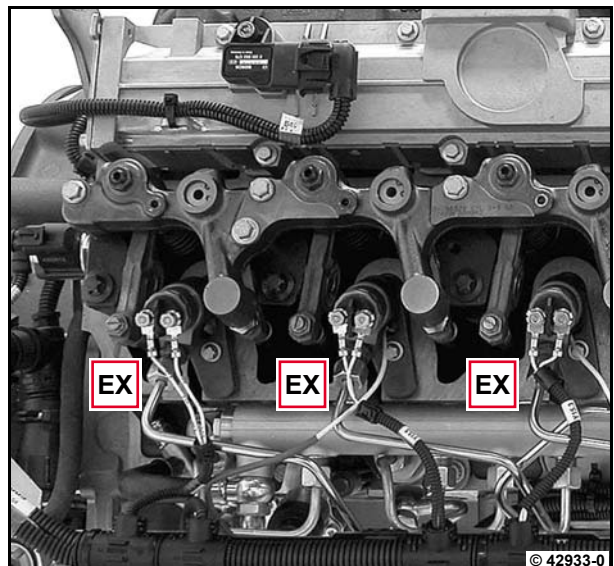
6



Valve overlap means:
Outlet valve is not yet closed. Inlet valve
begins to open.



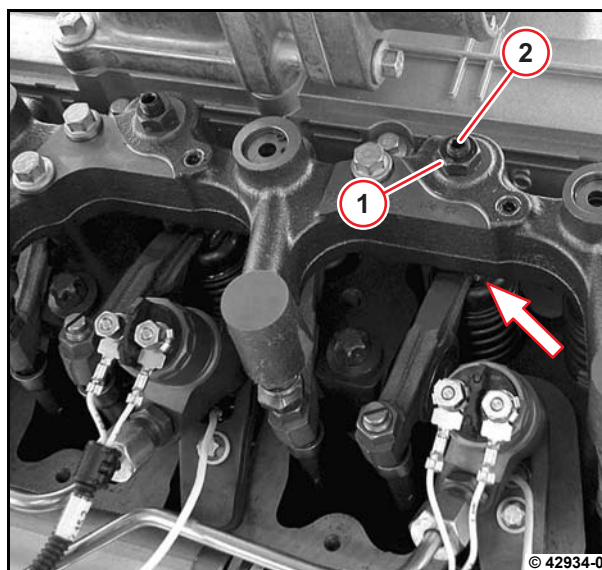
- Arrangement of the outlet valves.
EX = outlet valve



- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



The rocker arm must touch the thrust washer of the spring cap (arrow).

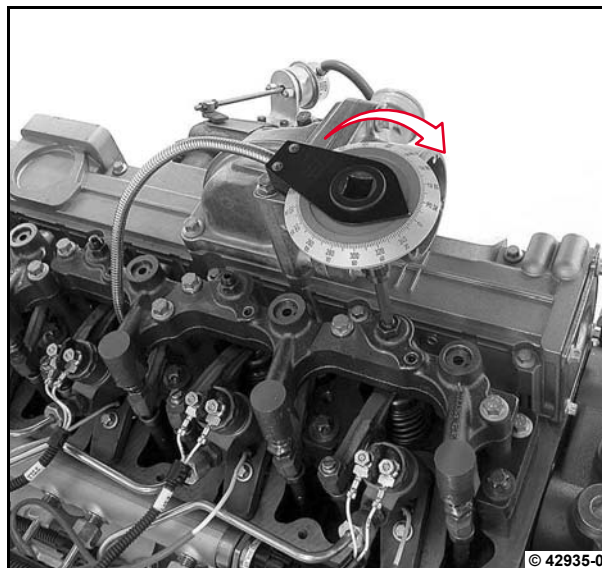


6

- Set the rotation angle disc on the setting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.



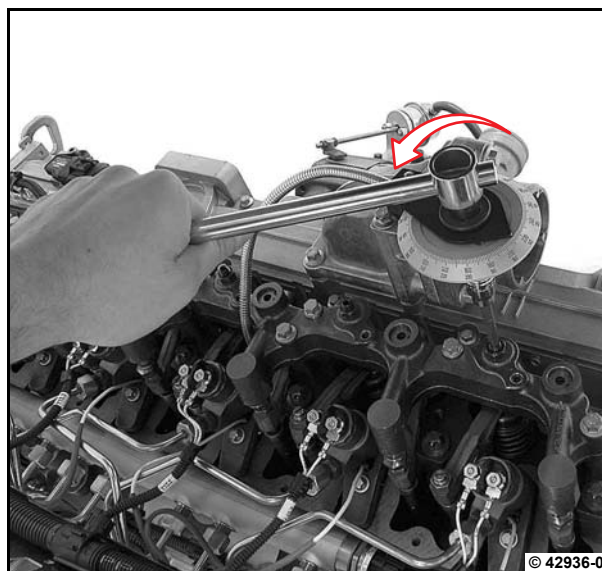
Be careful to turn the setting screw correctly.



- Turn the setting screw back by **144°** in the direction of the arrow.



A04 022



- Hold the setting screw to prevent it turning and tighten the lock nut (arrow) with the open wrench.

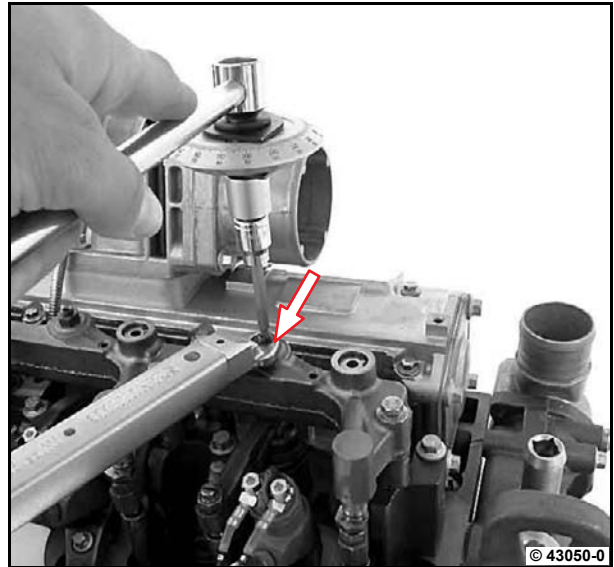


A01 004

- Remove rotation angle disc.



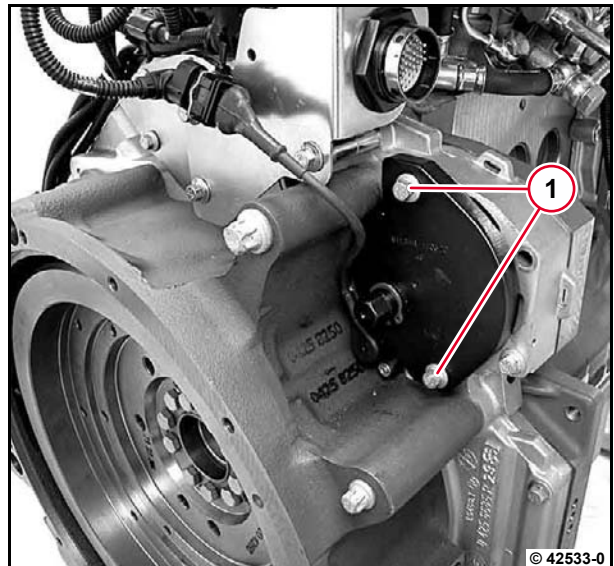
Set all other control pistons according to the valve setting schematic T01 63.



6

Assembly

- Unscrew screws (1) and remove turning gear.



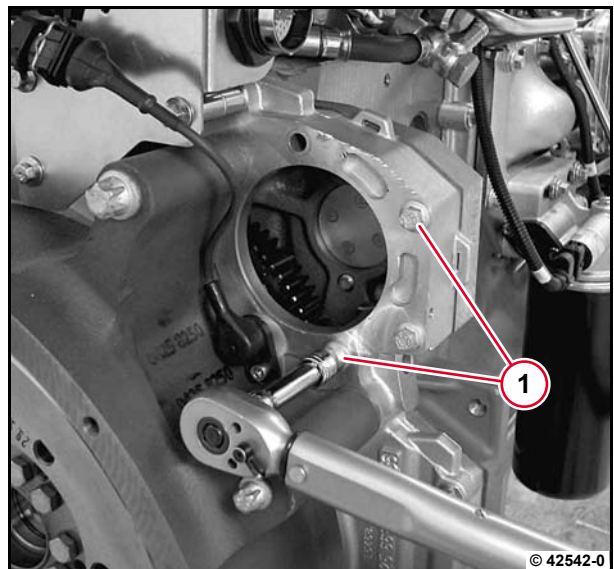
- Tighten screws (1).



A13 041



Use M8 x 45 mm screws.



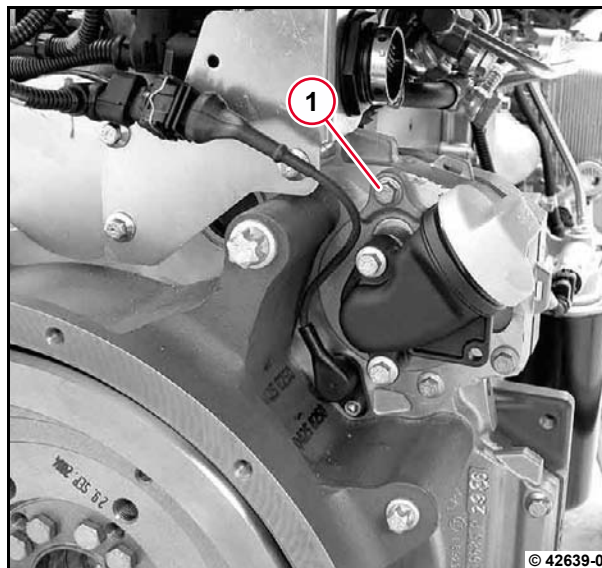
- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring.



- Press in cover to stop and tighten screw (1).



A04 022



Setting the valve clearance (with exhaust return module installed)



Commercial available tools:

- Rotation angle disc 8190
- Open wrench size 13 8196
- Crowfoot wrench size 15 8199
- Screwdriver insert for slot-
ted screws. 8191
- Screwdriver insert for
hexagon socket head
screws (4 mm) 8194

Special tools:

- Turning gear 100 320



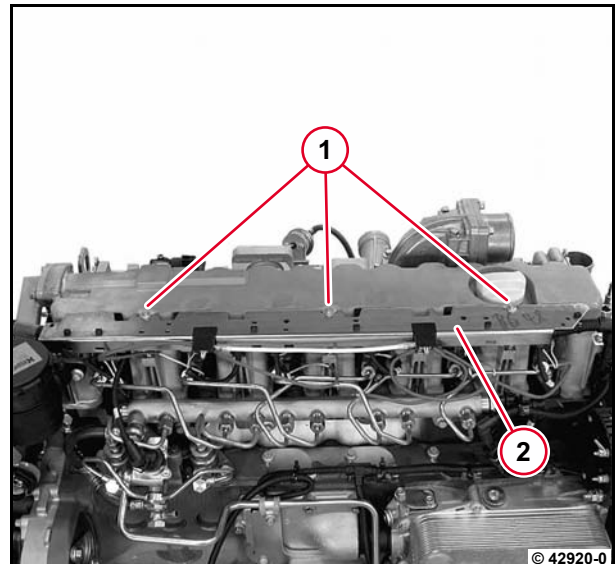
Allow the engine to cool down for at least 30 minutes before setting the valve clearance.

Engine oil temperature < 80 °C.

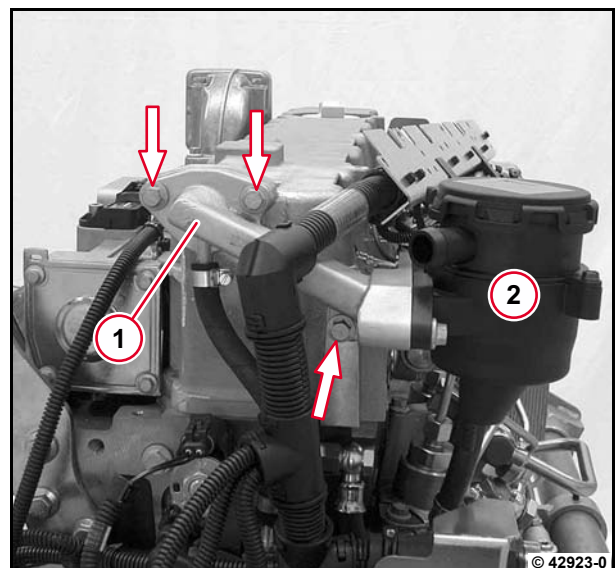
The control piston clearance of the exhaust return line must be set after setting the valve clearance.

Disassembly

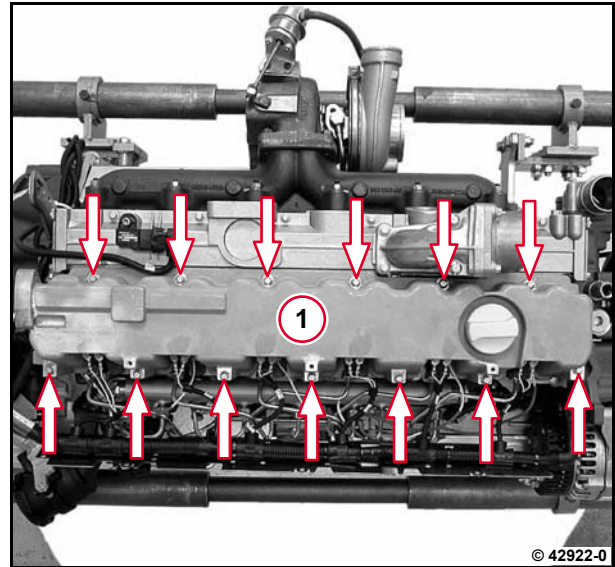
- Unscrew screws (1) and remove cover plate (2).



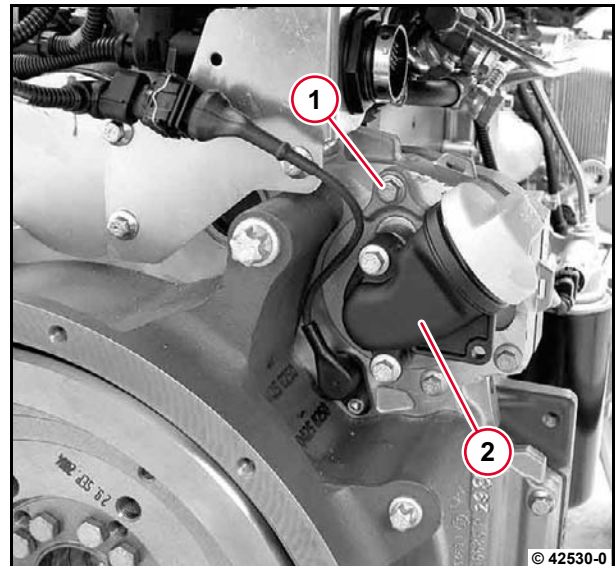
- Unscrew screws (arrows), remove ventilation duct (1) with crankcase venting (2) and hang to one side.



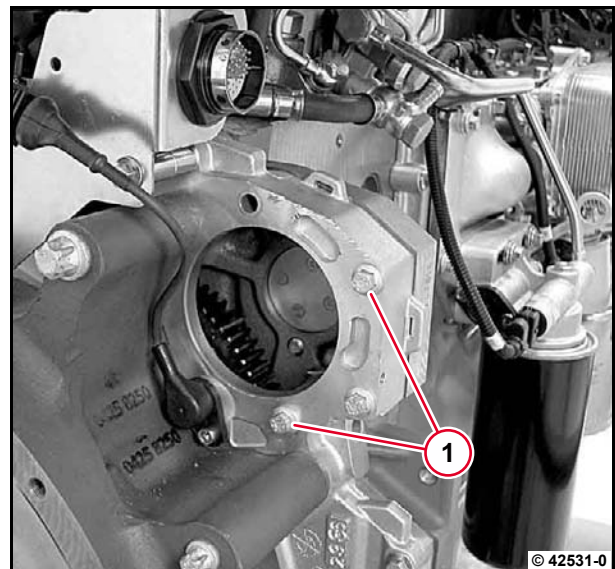
- Unscrew screws (arrows), remove cylinder head cover (1) and gasket.



- Unscrew screw (1), remove cover (2) with oil filling nozzles.



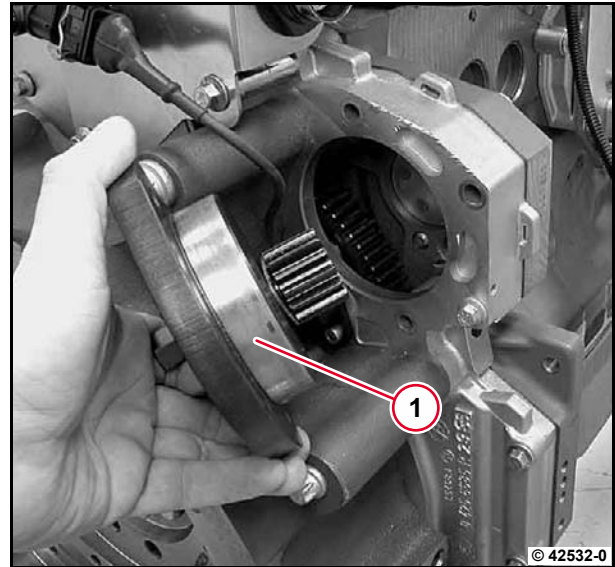
- Unscrew screws (1).



- Insert turning gear (1).

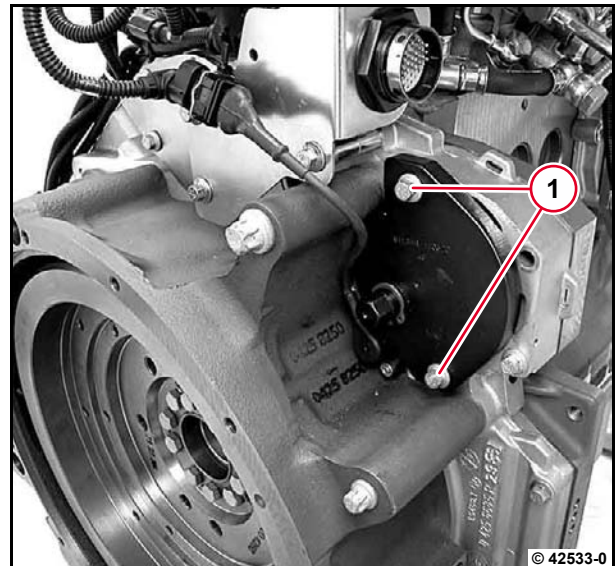


The gear wheel of the turning gear must grip into the teeth of the camshaft gear wheel.



6

- Tighten screws (1).

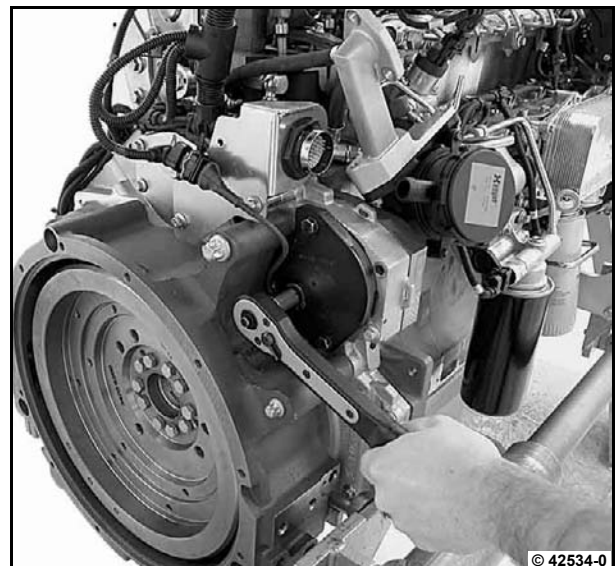


Setting engine to valve overlap

- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.

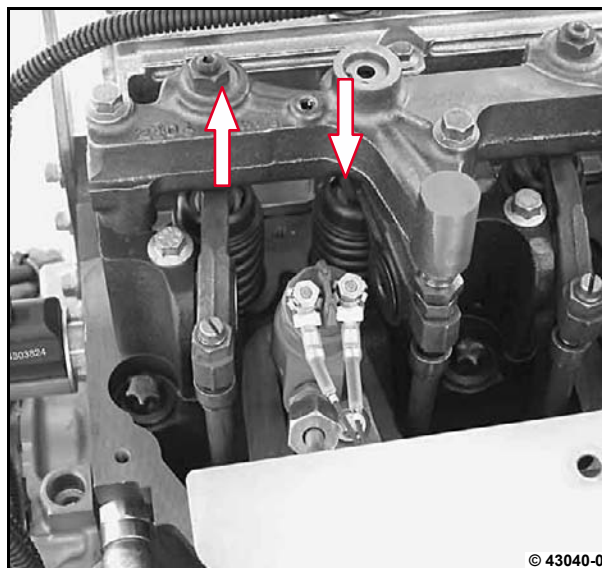


Removing and installing the exhaust return module





Valve overlap means:
Outlet valve is not yet closed. Inlet valve
begins to open.



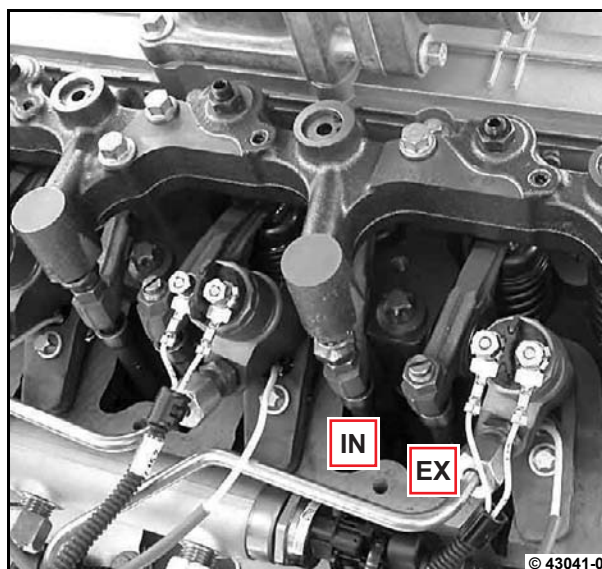
Set valve clearance according to the setting schematic

- Arrangement of the inlet and outlet valves.
IN = inlet valve
EX = outlet valve



Attention!

Note design of the setting screw (with slot, wrench size or hexagon socket).

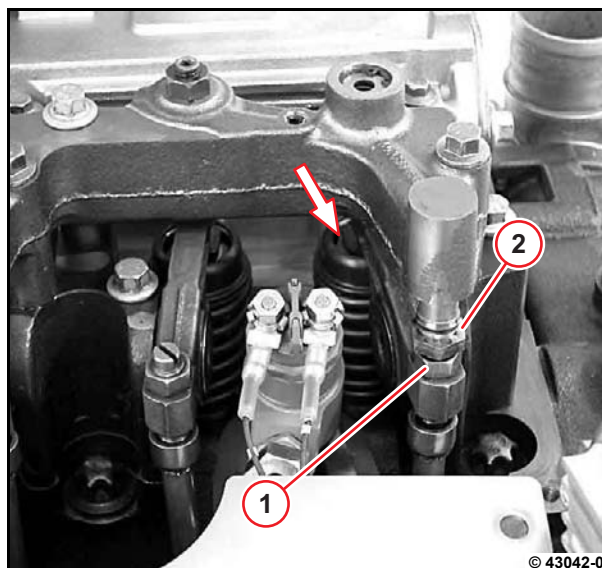


Setting the inlet valve clearance

- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



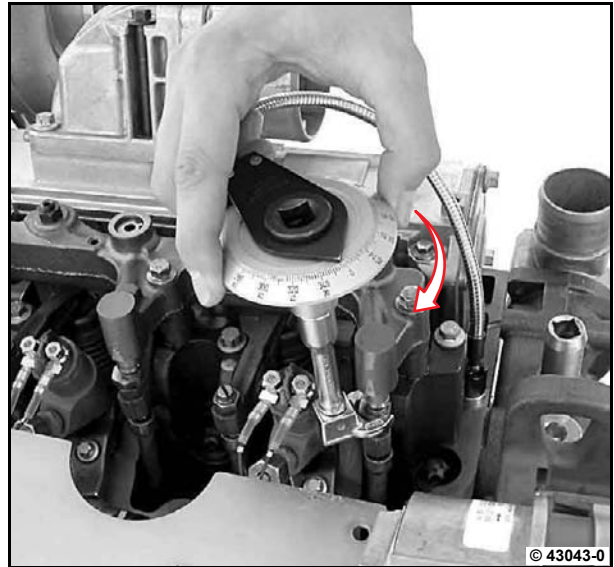
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the setting screw with the crowfoot wrench.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.



Be careful to turn the setting screw correctly.

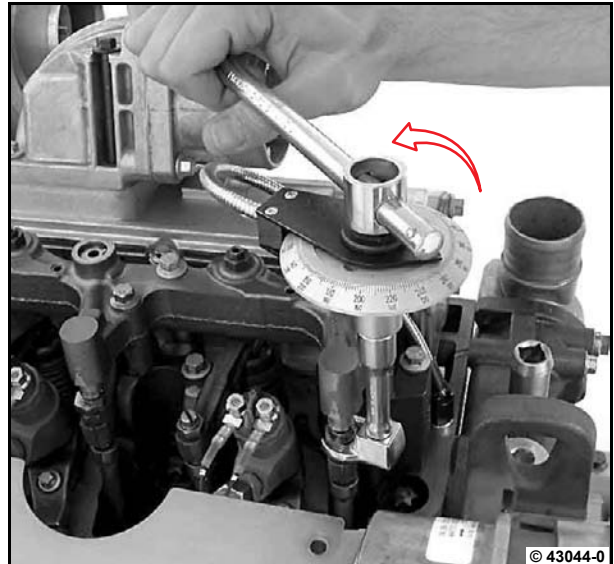


6

- Turn the setting screw back **by 75°** in the direction of the arrow.



P01 63

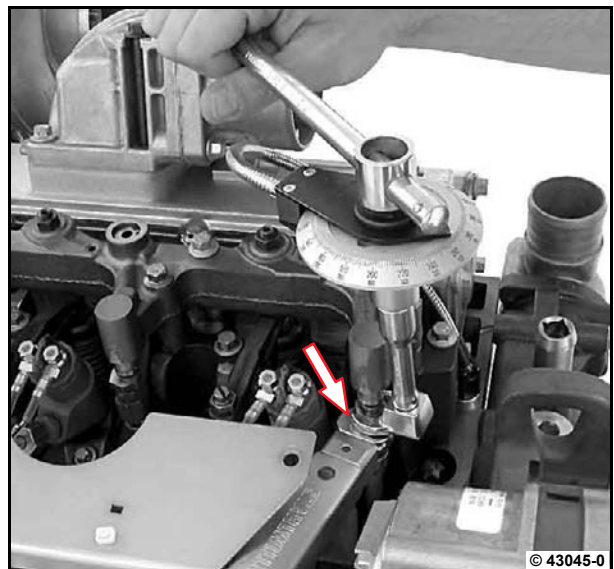


- Hold the setting screw to prevent it turning and tighten the lock nut (arrow) with the open wrench.



P01 63

- Remove rotation angle disc.

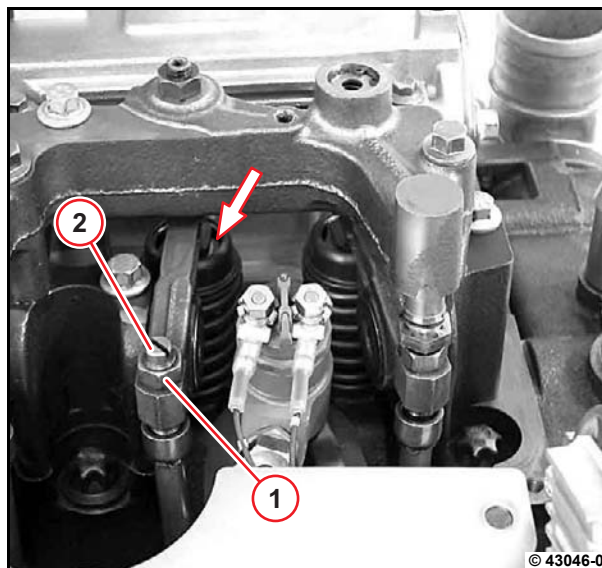


Setting the outlet valve clearance

- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



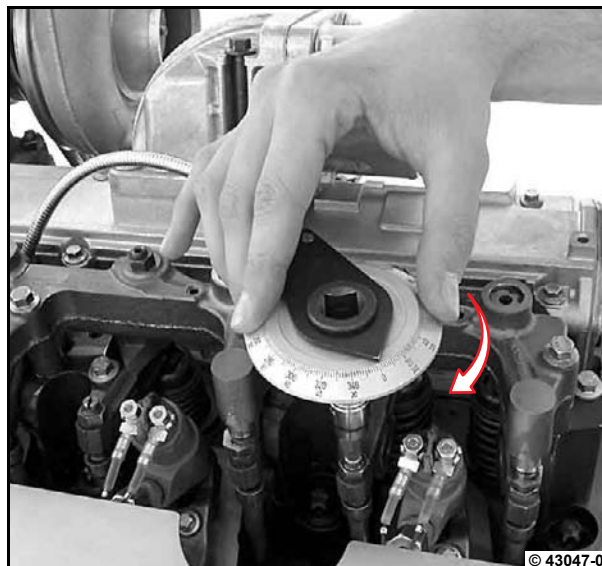
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the setting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.



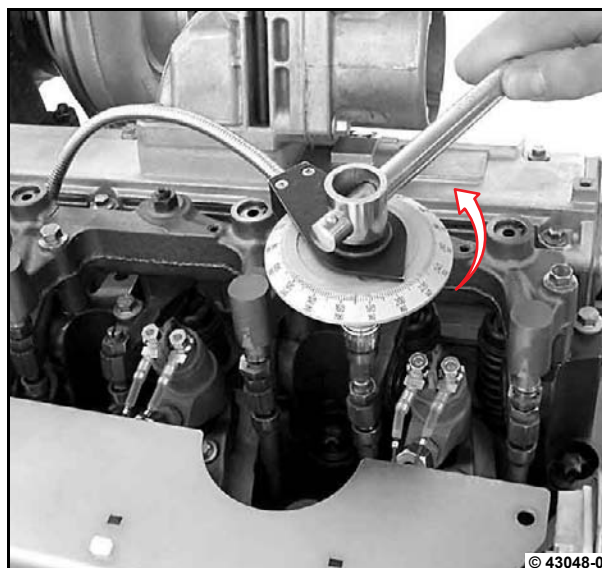
Be careful to turn the setting screw correctly.



- Turn the setting screw back by **120°** in the direction of the arrow.



P01 61



- Hold the setting screw to prevent it turning wrongly and tighten the lock nut (arrow) with the open wrench.

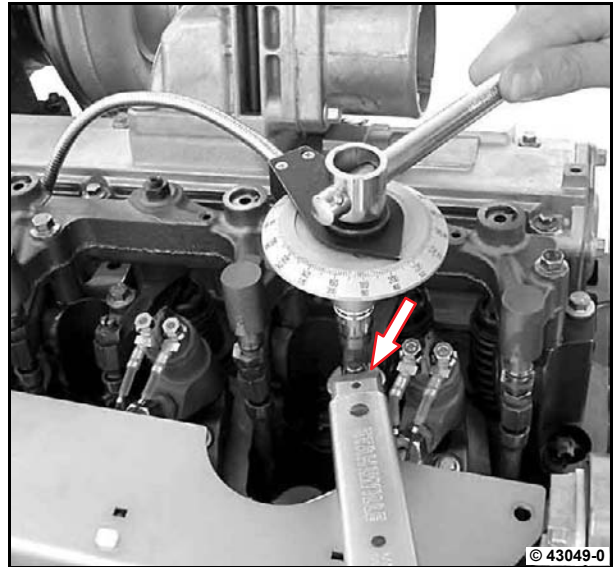


A01 003

- Remove rotation angle disc.



Set all other valves according to the valve setting schematic T01 63.



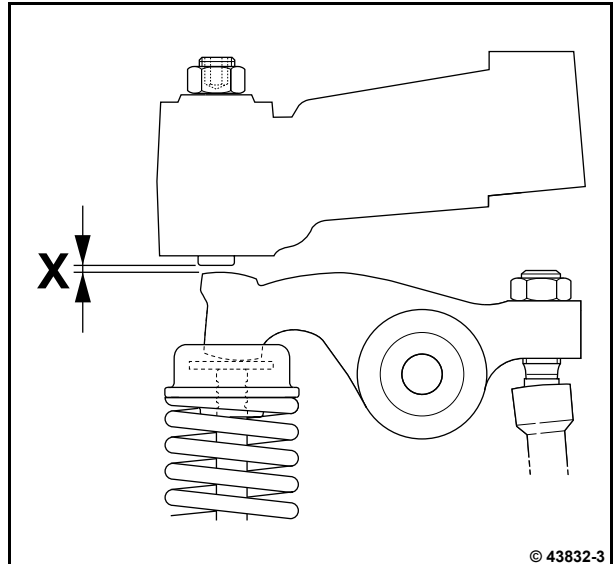
6

Setting the control piston clearance



The control piston clearance (X) must be set after setting the valve clearance.

The order of setting the control piston clearance is identical with the valve setting schematic T01 63.

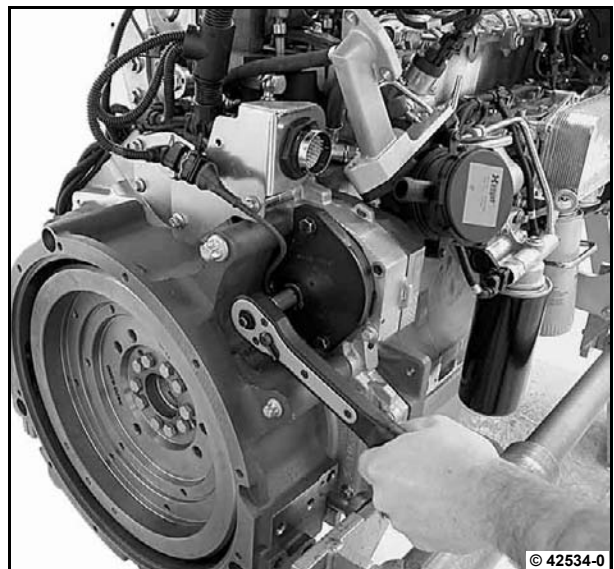


Setting engine to valve overlap

- Turn crankshaft using the turning gear until the valve overlap of cylinder 1 is reached.

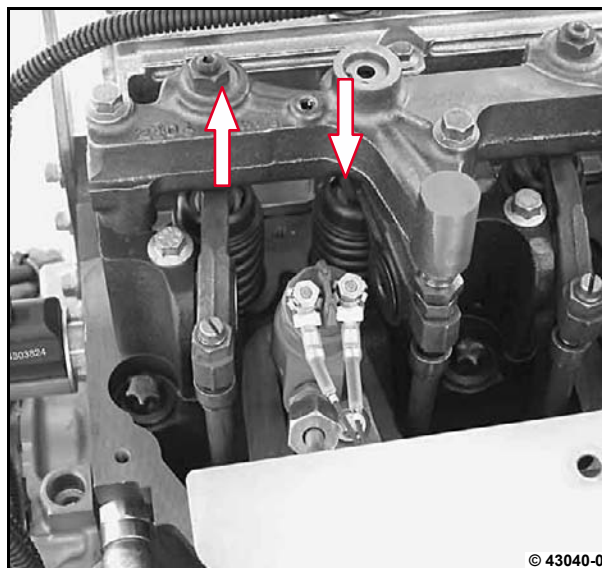


P01 62

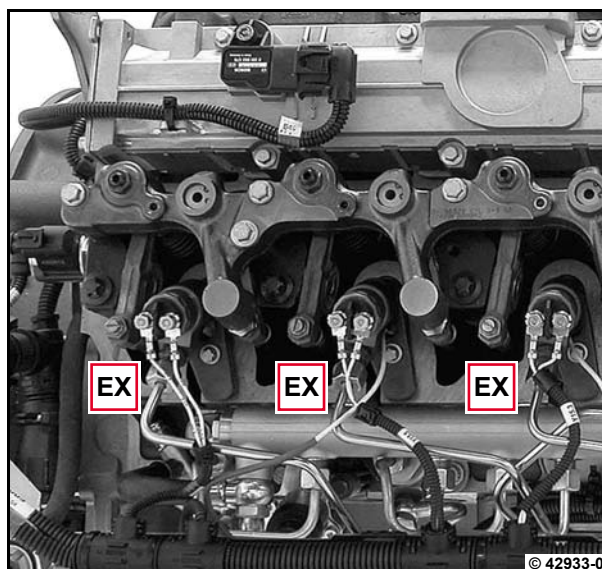




Valve overlap means:
Outlet valve is not yet closed, inlet valve begins to open.



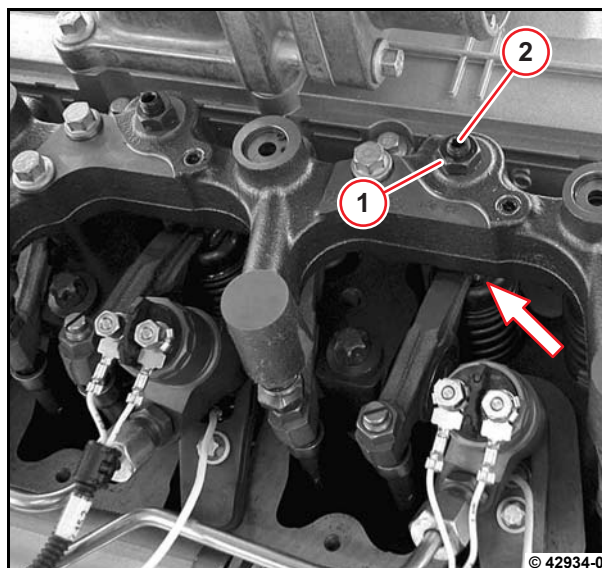
- Arrangement of the outlet valves.
EX = outlet valve



- Loosen lock nut (1).
- Press in the setting screw (2) to the stop.



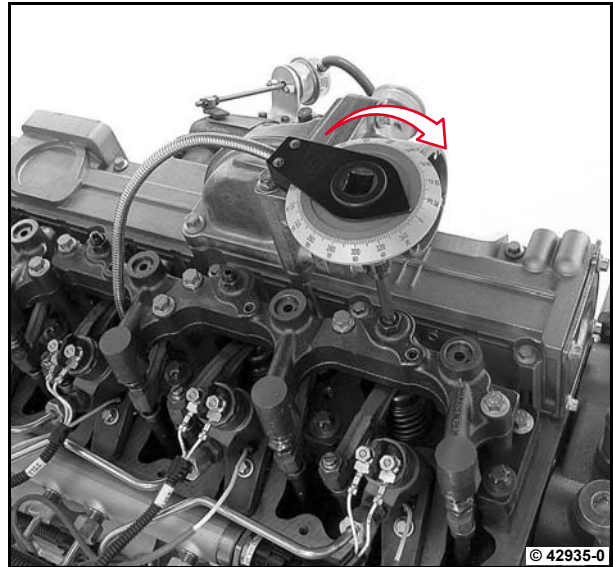
The rocker arm must touch the thrust washer of the spring cap (arrow).



- Set the rotation angle disc on the setting screw with a screwdriver insert for slotted screws.
- Fix magnet of rotation angle disc on cylinder head.
- Set the rotation angle disc in the direction of the arrow to **zero**.



Be careful to turn the setting screw correctly.

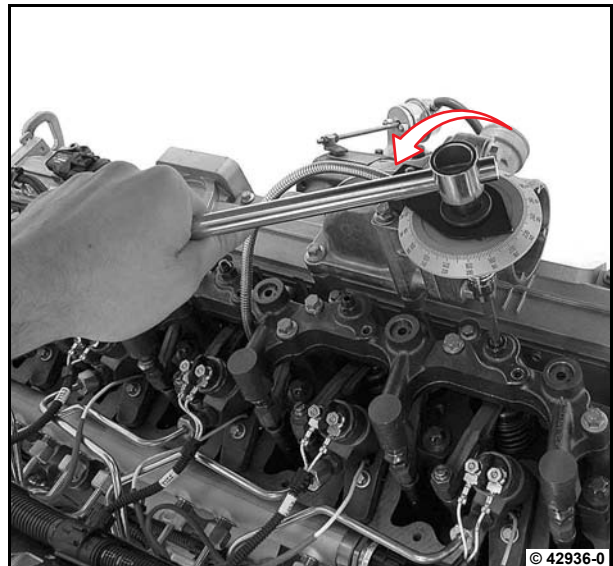


6

- Turn the setting screw back by **144°** in the direction of the arrow.



A01 003



- Hold the setting screw to prevent it turning wrongly and tighten the lock nut (arrow) with the open wrench.

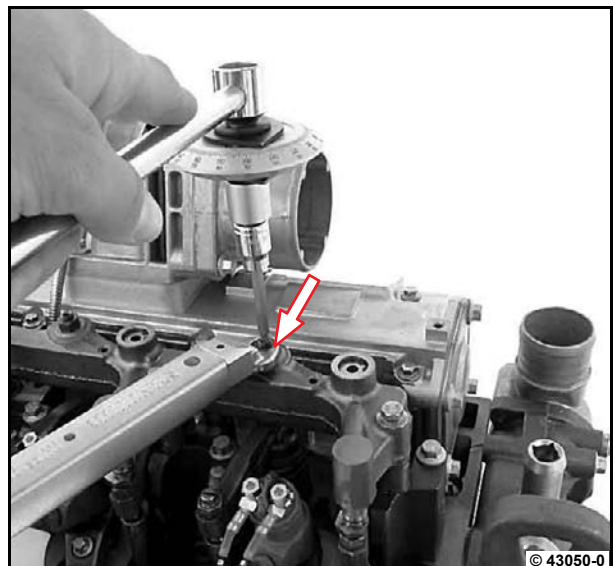


Removing and installing the exhaust return module

- Remove rotation angle disc.

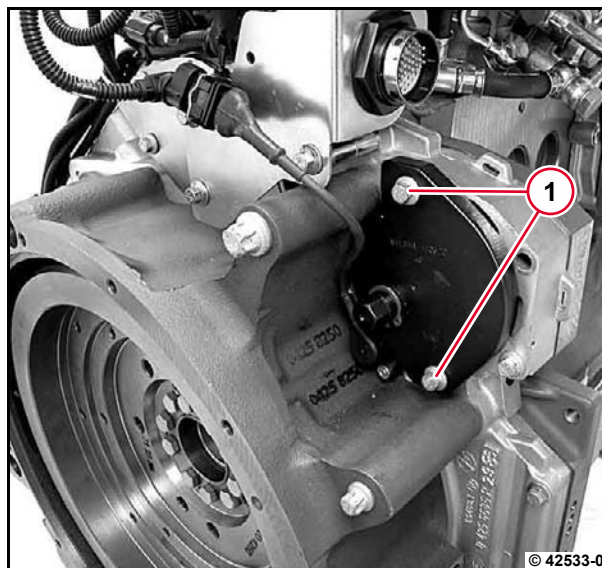


Set all other control pistons according to the valve setting schematic T01 63.



Assembly

- Unscrew screws (1) and remove turning gear.



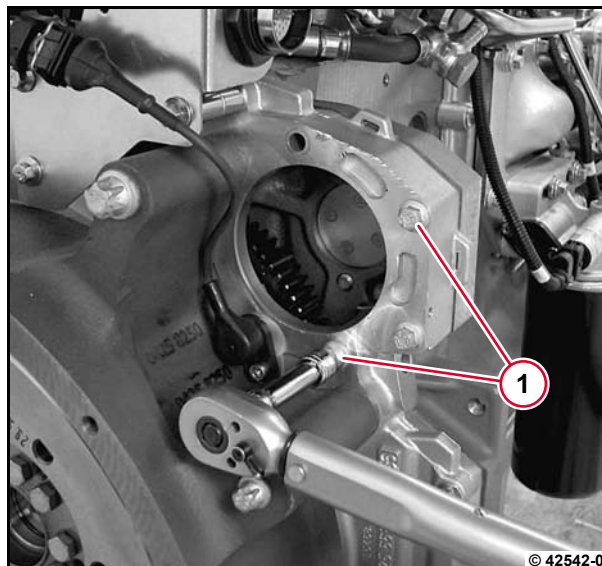
- Tighten screws (1).



P01 63



Use M8 x 45 mm screws.

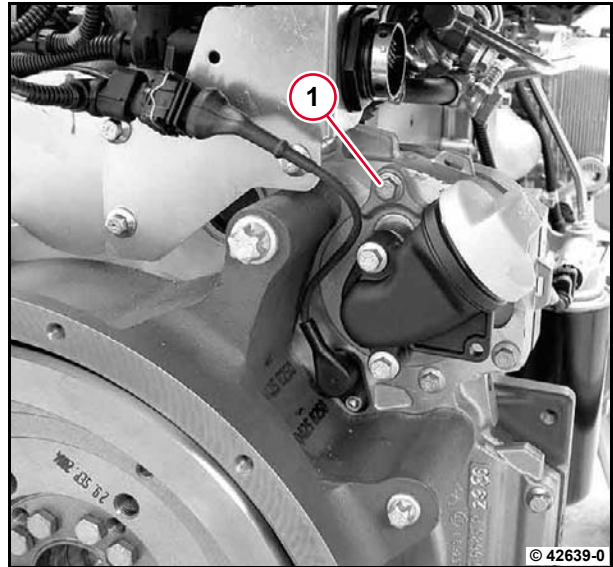


- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring.



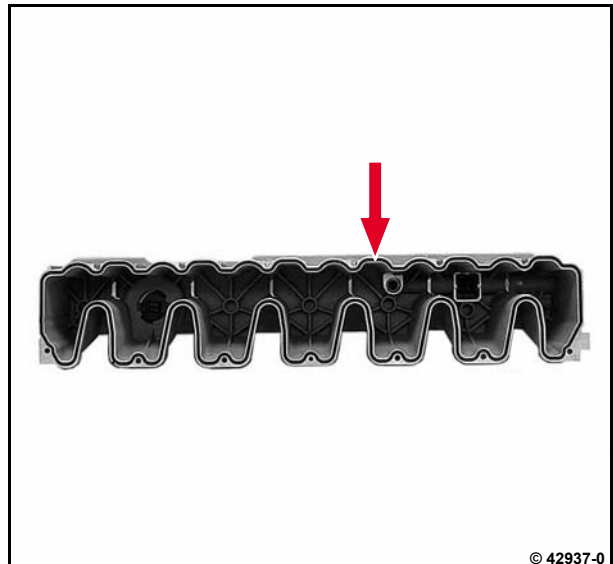
- Press in cover to stop and tighten screw (1).

 P01 64



6

- Clean the sealing surface on the cylinder head cover and cylinder head.
- Insert new gasket (arrow).



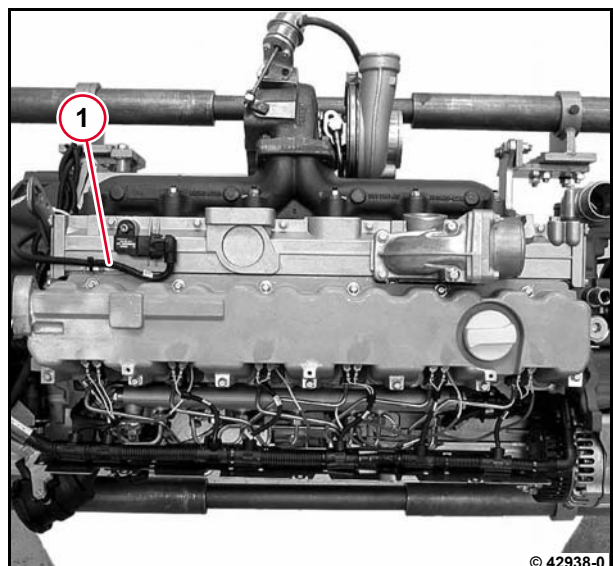
- Mount cylinder head cover and tighten screws alternately.

 A01 012

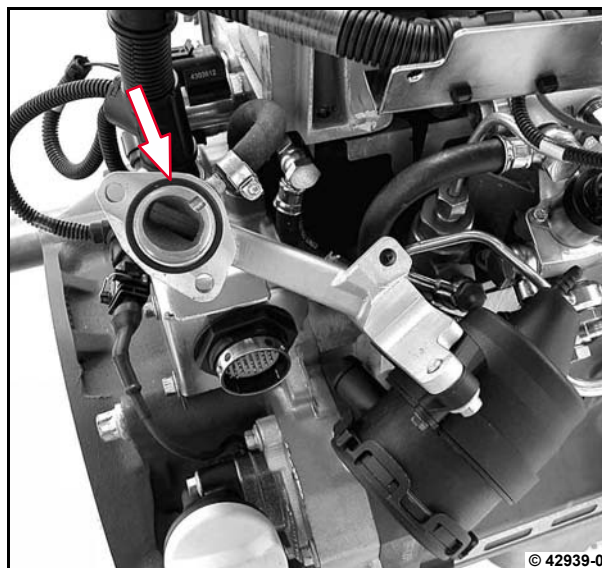


Attention!

Do not trap the cable (1) when mounting the cylinder head cover.



- Clean the sealing surface on the ventilation duct and cylinder head cover.
- Insert new gasket (arrow).

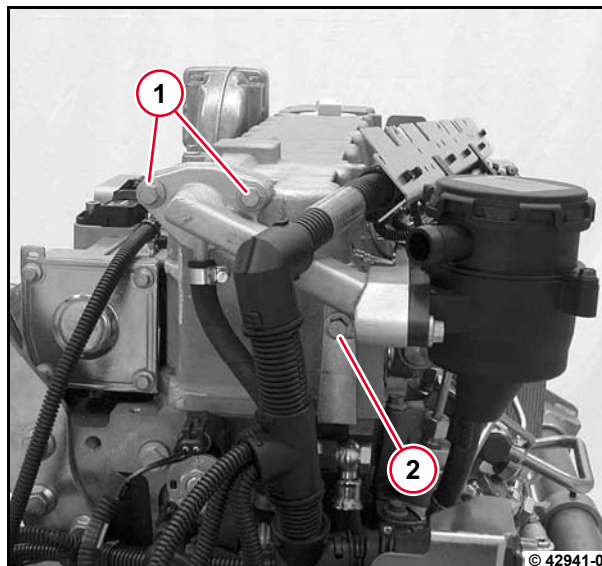


- Mount ventilation duct with crankcase venting and tighten screws.



Note different screw length:
Screws M8 x 25 mm (1)
Screw M8 x 20 mm (2)

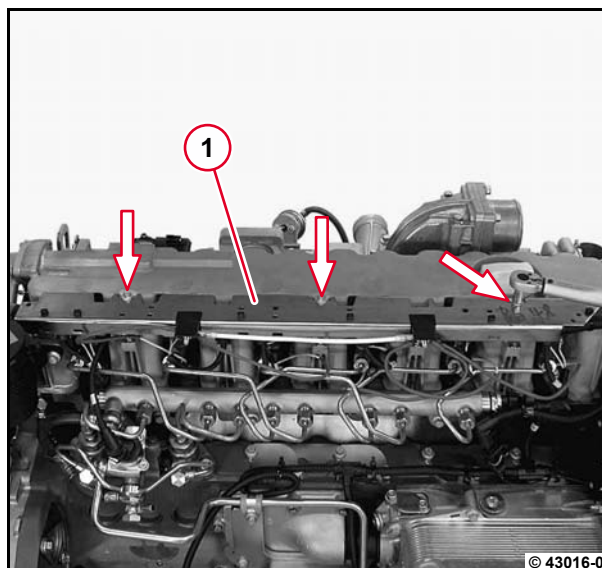
- Tighten screws.



- Mount the cover plate (1) and tighten the screws (arrows).



A03 092



Removing and installing the rocker arm and rocker arm bracket



Commercial available tools:

– Socket wrench insert 8113

Special tools:

– Turning gear 100 320



– W 01-01-01

– W 06-09-01

Removing the rocker arm and rocker arm bracket

- Remove exhaust return module.

 W 06-09-01

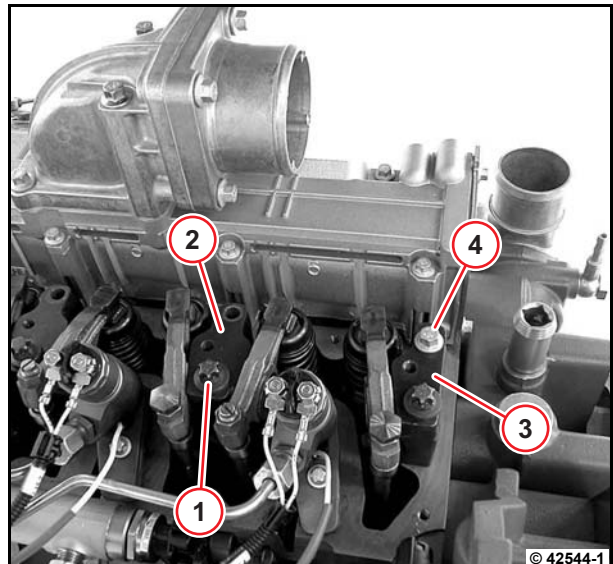
- Unscrew cylinder head screw (1) and remove rocker arm with rocker arm bracket (2).



Use socket wrench insert.

When disassembling the rocker arm bracket (3), the screw (4) must also be unscrewed.

Lay out components in the order in which they should be installed.

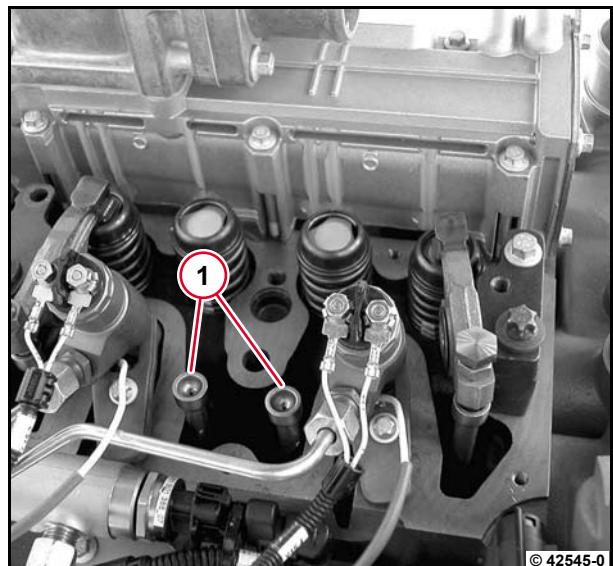


- Remove stop rods (1).



Lay out components in the order in which they should be installed.

- Visually inspect the components.

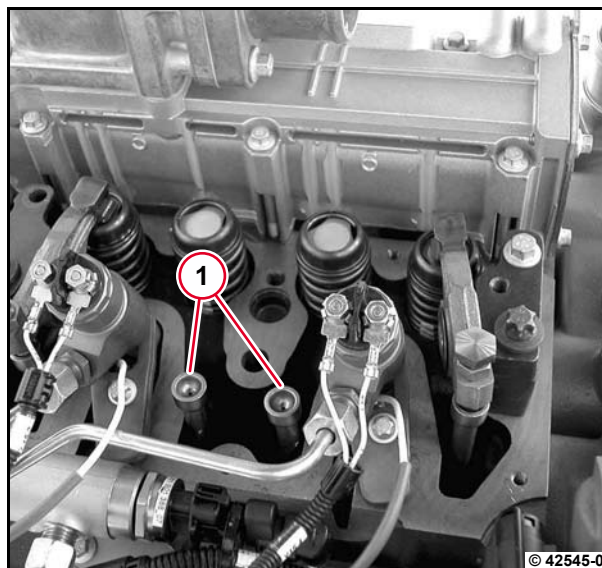


Installing the rocker arm and rocker arm bracket

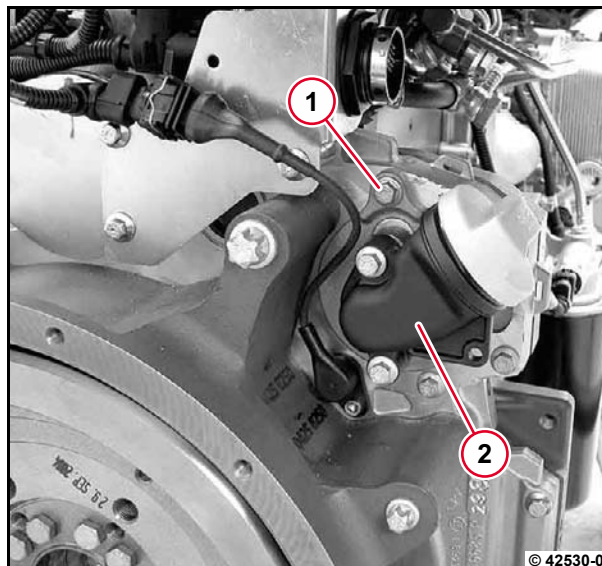
- Insert stop rods (1).



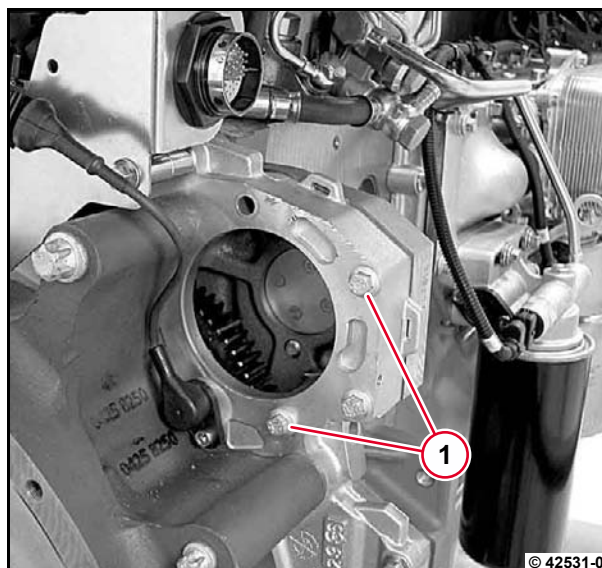
Note the assignment of the stop rods.
The stop rod must be seated with the ball head in the ladle of the tappet.



- Unscrew screw (1), remove cover (2) with oil filling nozzles.



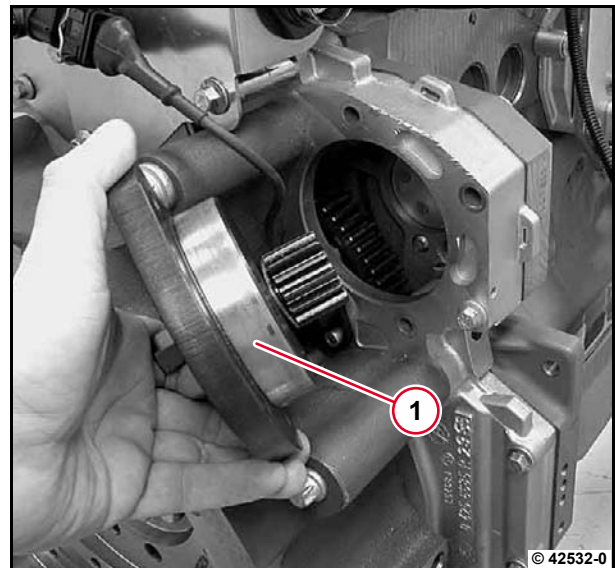
- Unscrew screws (1).



- Insert turning gear (1).

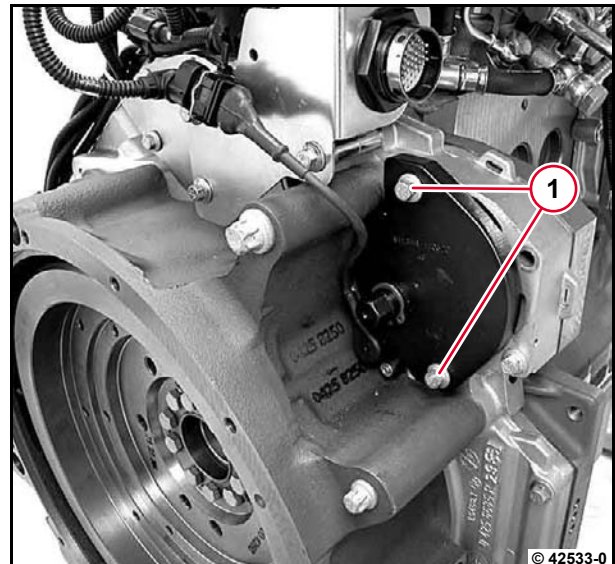


The gear wheel of the turning gear must grip into the teeth of the camshaft gear wheel.

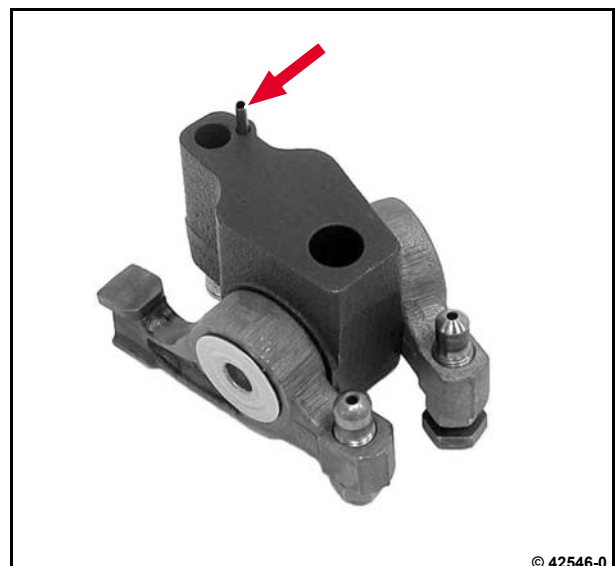


6

- Tighten screws (1).



Make sure the clamping pin (arrow) is in place.

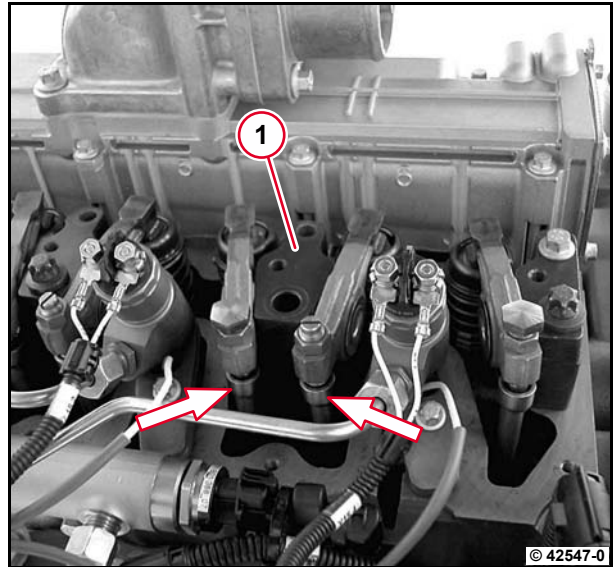


- Mount rocker arm bracket (1).



The clamping pin must grip the fit bore in the cylinder head.

The ball heads must be seated in the ladders of the stop rods (arrows).

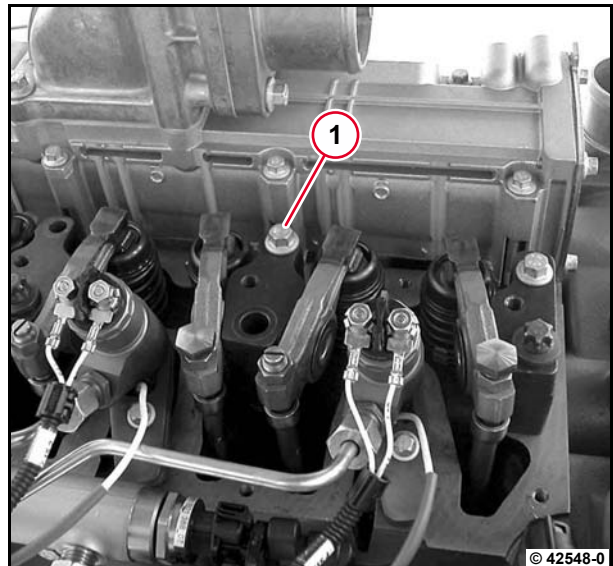


- Fasten screw (1).



Use M8 x 60 mm screw.

Do not tighten screw.



- Lightly oil cylinder head screw (1) and tighten slightly.

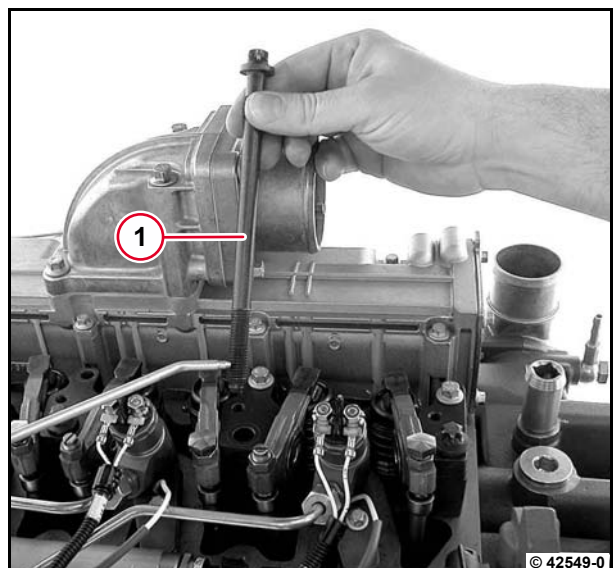


Attention!

Cylinder head screws can be used **max. 3 times** with written proof, otherwise renew every time they are loosened.



Do not tighten screw.



- Align rocker arm bracket symmetrically with the valve axles.
- Pre-tension the cylinder head screw.



A01 001

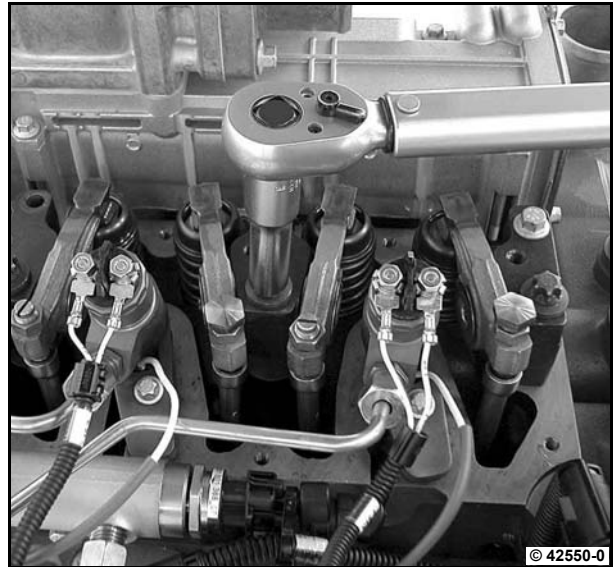


Attention!

Makes sure that the stop rods are not under stress due to valve overlap when fastening the screw.



Use socket wrench insert.

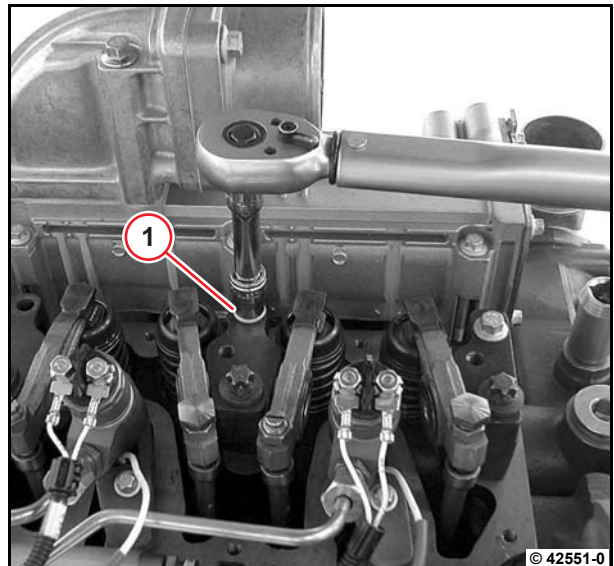


6

- Tighten screw (1).



A01 002



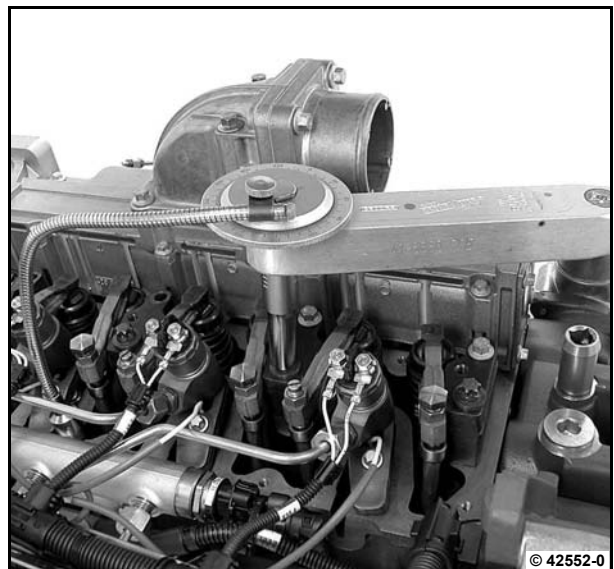
- Tighten the cylinder head screw.



A01 001



Use socket wrench insert.



- Unscrew screw (1).



When mounting the rocker arm bracket (2), the screw (3) remains installed.

- Set valve clearance (without or with removal of exhaust return module).

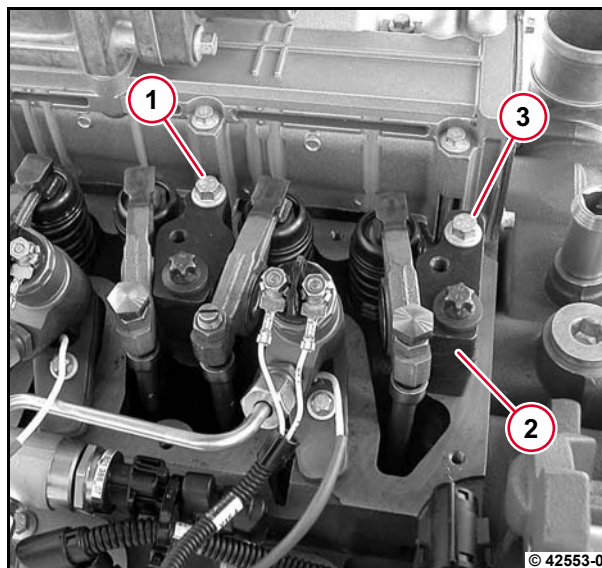


W 01-01-01

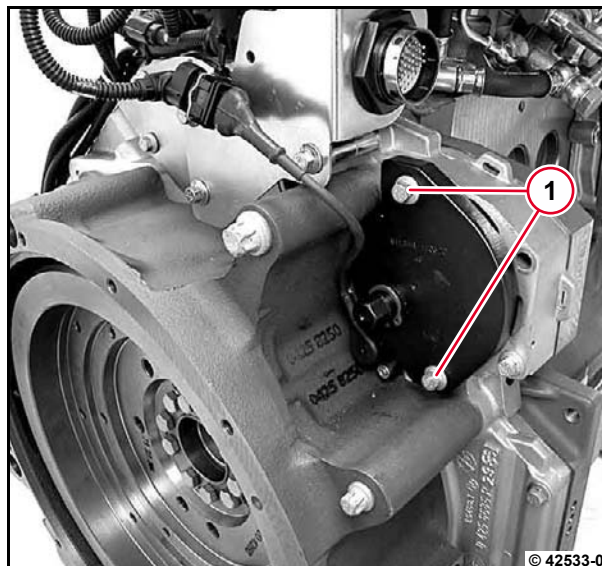
- Install exhaust return module.



W 06-09-01



- Unscrew screws (1) and remove turning gear.



- Tighten screws (1).



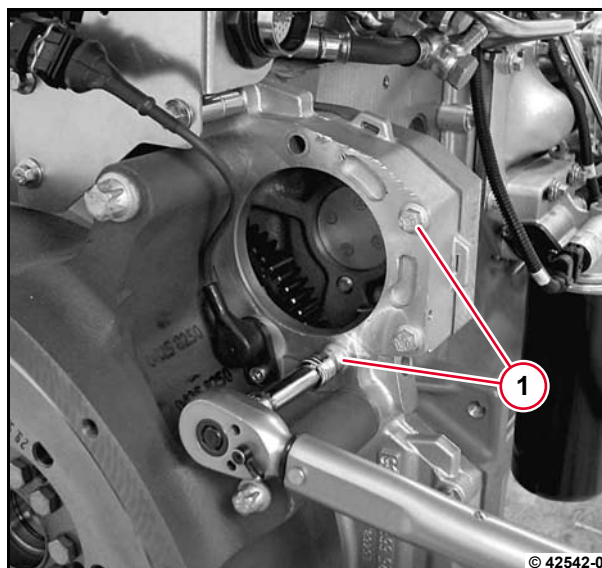
A03 092



Use M8 x 45 mm screws.



Note different screw sizes:



- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring (1).



6

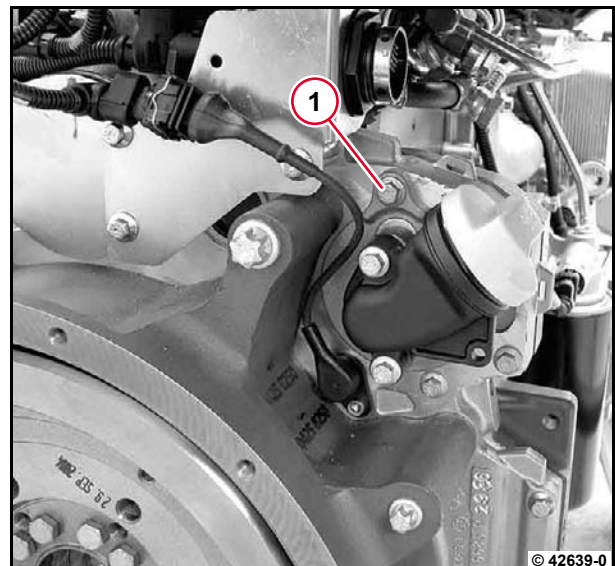
- Press in cover to stop and tighten screw (1).



A04 022



Note different screw sizes:



Disassembling, assembling and checking the rocker arm and rocker arm bracket



Commercial available tools:

- Internal precision measuring device
- Micrometer gauge

Special tools:

- Dial gauge. 100 400



– W 01-02-02

6

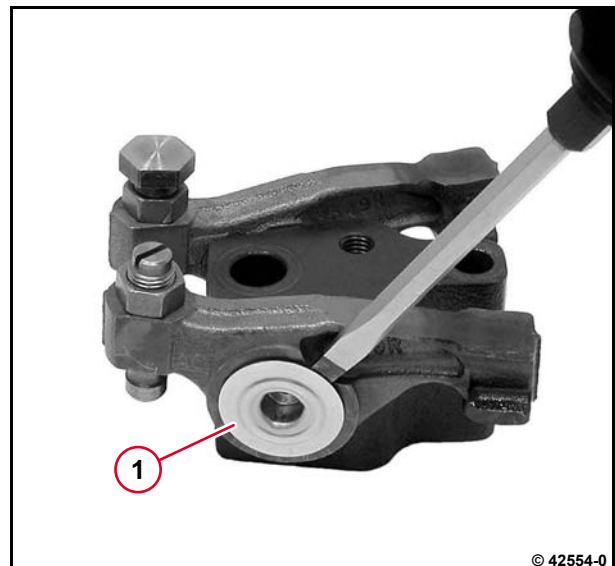
Disassembling the rocker arm bracket

- Remove rocker arm and rocker arm bracket.



W 01-02-02

- Remove lock washers (1) on both sides.



© 42554-0

- Remove rocker arm.



Lay out components in the order in which they should be installed.



© 42555-0

Checking the rocker arm

- Measure rocker arm bore with internal precision measuring device.



P01 72

P01 73



When the wear limit is reached the rocker arm must be replaced.



- Unscrew the lock nut (1) from the setting screw (2).
- Loosen the lock nut (3) from the setting screw (4).

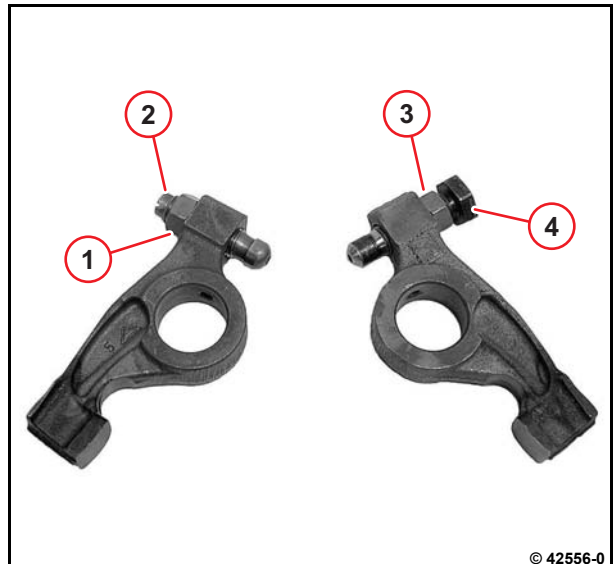


Attention!

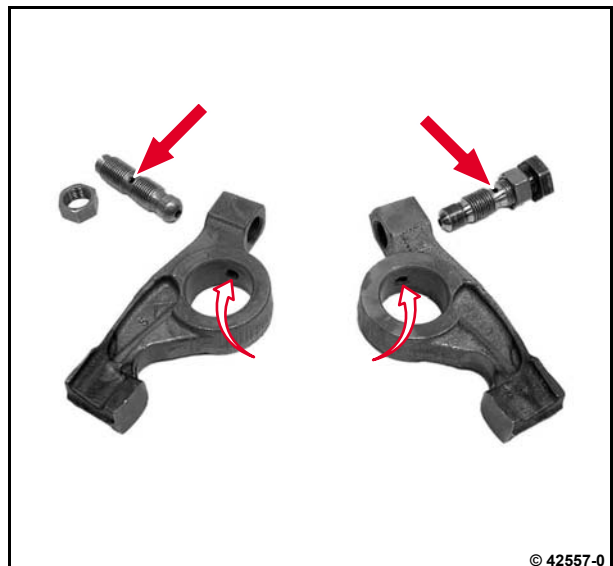
Note design of the setting screw (with slot, wrench size or hexagon socket).



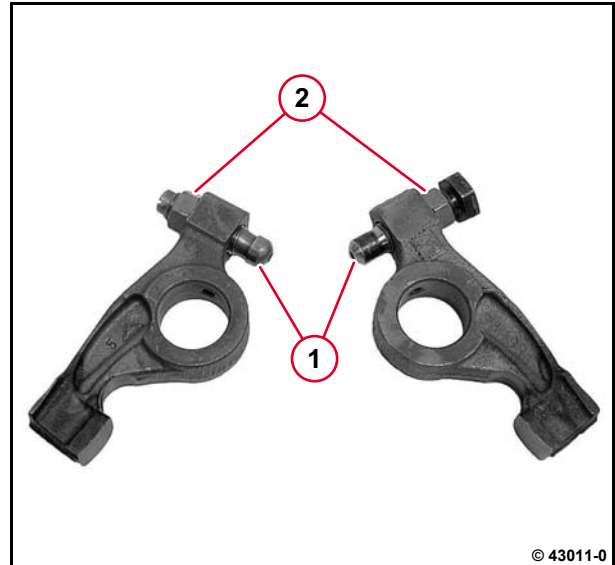
Lay out components in the order in which they should be installed.



- Check components for visible signs of wear.
- Check oil channels (arrows) for free passage.



- Screw setting screw (1) into the rocker arm and tighten the lock nut (2).



6

Checking the rocker arm pin

- Measure the diameter of the rocker arm pin with the micrometer gauge.



P01 74



When the wear limit is reached the rocker arm bracket must be replaced.



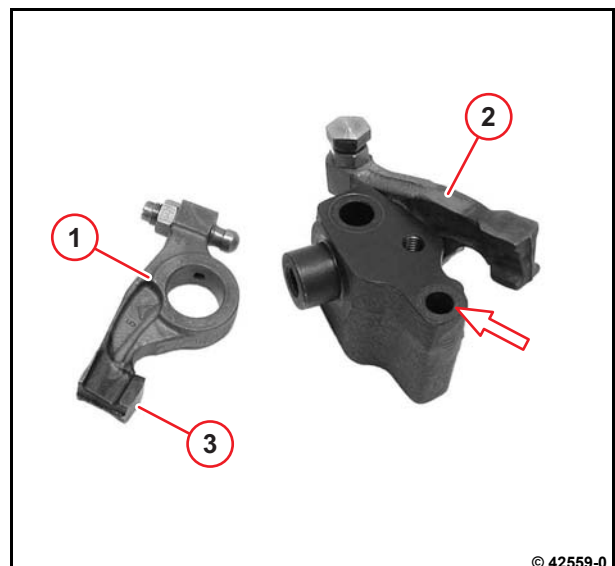
Assembling the rocker arm bracket

- Lightly oil the rocker arm pin.
- Push the rocker arm (1 and 2) onto the rocker arm pin.



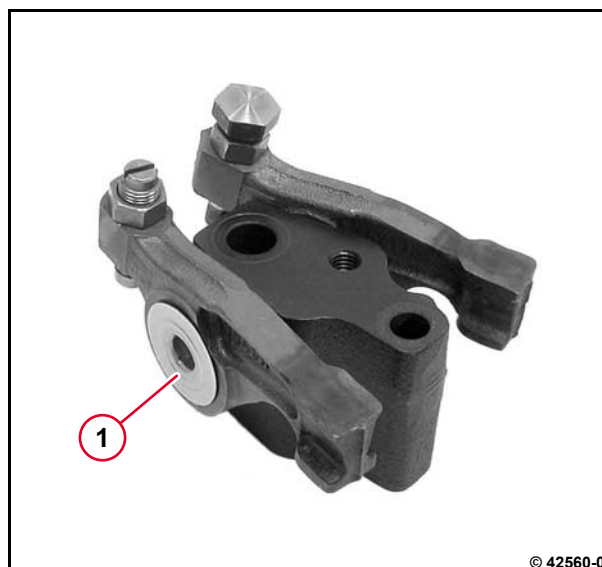
The rocker arm's sliding surface (3) must face the small hole (arrow).

The rocker arm (1) must be mounted on the outlet side and the rocker arm (2) on the inlet side.



- Press new lock washers (1) into the rocker arm pin up to the stop on both rocker arms.
- Install rocker arm and rocker arm bracket.

 [W 01-02-02](#)



Removing and installing cylinder head



Commercial available tools:

- Socket wrench set 8113

Special tools:

- Turning gear100 330
- Dial gauge.100 400
- Measuring apparatus100 750



- W 01-01-01
- W 01-02-02
- W 06-01-05
- W 06-07-03
- W 06-09-01
- W 06-09-02
- W 07-15-08
- W 09-13-03
- W 13-06-01

Removing cylinder head

- Remove fan console.

 W 09-13-03

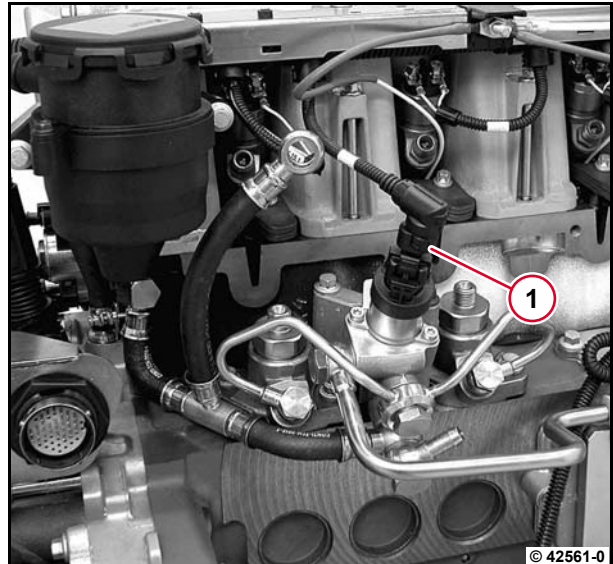
- Remove exhaust manifold.

 W 06-01-05

- Remove rail.

 W 07-15-08

- Unlock cable plug (1) and remove.



- Remove heating plugs.

 W 13-06-01

- Remove solenoid valve (exhaust return line).

 W 06-09-02

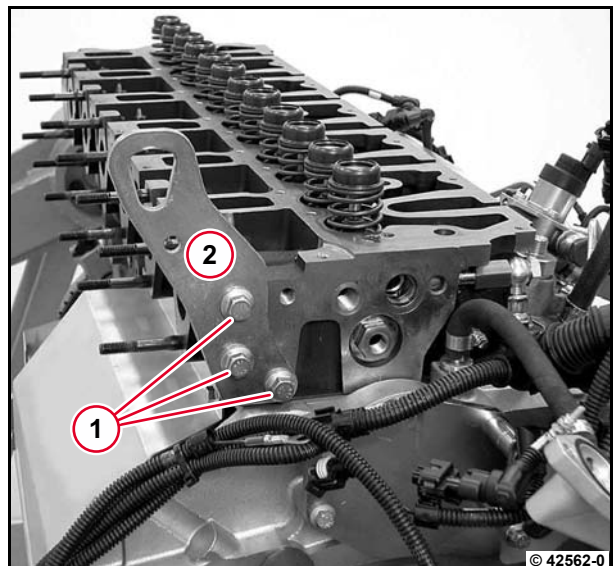
- Remove rocker arm brackets and stop rods.

 W 01-02-02

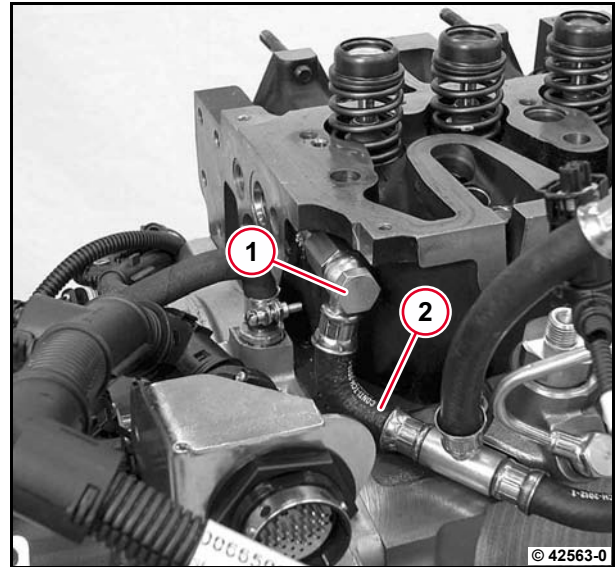
- Remove charge air line.

 W 06-07-03

- Unscrew screws (1) and remove transport flange (2).



- Unscrew hollow screw (1), remove fuel return line (2) and sealing rings.

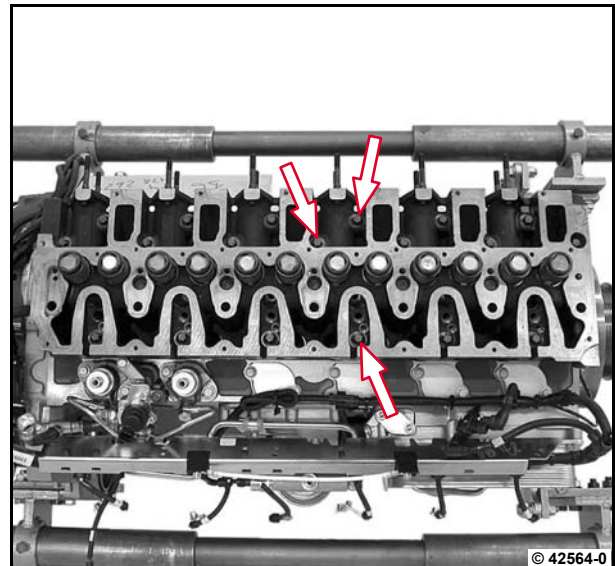


- Unscrew all screws (arrows), remove cylinder head and gasket.



Use socket wrench set.

- Clean the sealing surfaces on the cylinder head and crankcase.



Installing cylinder head



The piston projection must be measured on all pistons.

The cylinder head gasket must be selected according to the greatest measured piston projection.

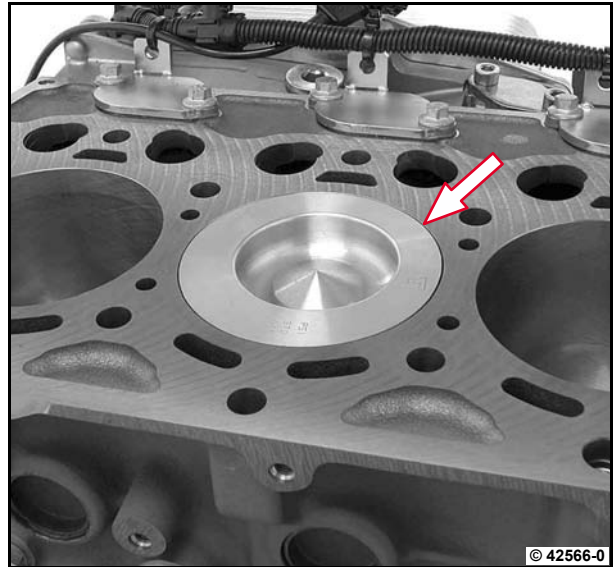
The appropriate cylinder head gasket must be determined before installing the cylinder head.



- Turn the crankshaft until the piston is flush with the crankshaft (arrow).



Use the turning gear 100 330 to turn the crankshaft.

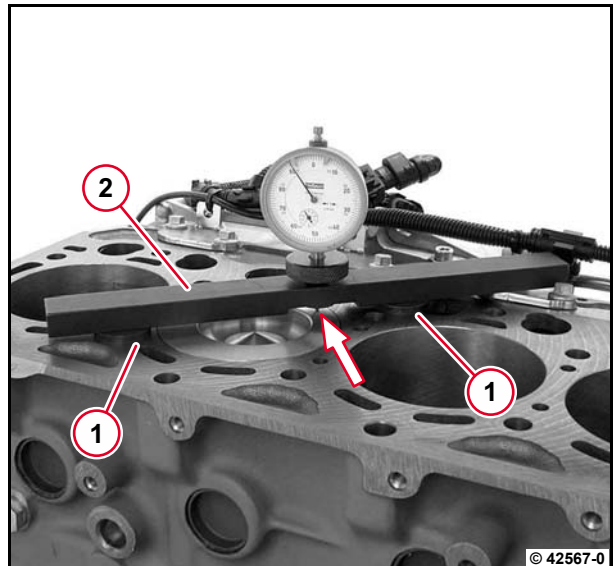


6

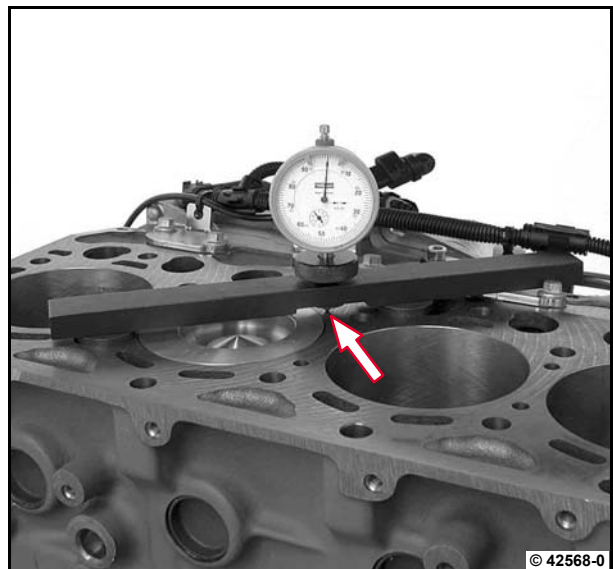
- Place the spacer plate (1) and measuring beam (2) on the crankcase.
- Insert the dial gauge in the measuring beam and position the stylus under pre-tension on the piston base (arrow).
- Continue turning the crankshaft evenly until the reversal point of the pointer on the dial gauge is reached.



The piston is now at top dead centre (TDC).



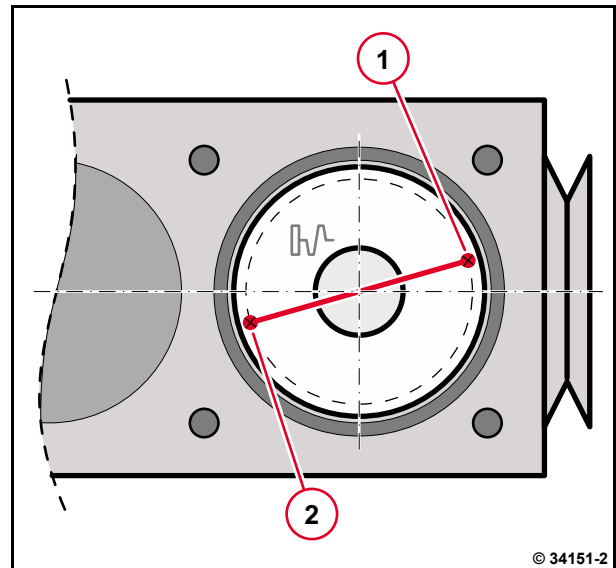
- Move the measuring beam and spacer plate.
- Apply stylus of the dial gauge to the crankcase sealing surface with pre-tension (arrow).
- Set the dial gauge to **zero**.



- Remove measuring points.



Diagram for measuring the piston projection at the points (1 and 2).



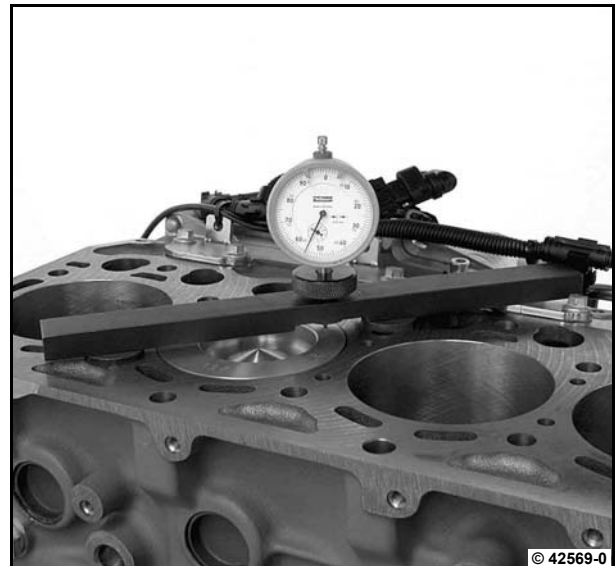
- Align the measuring beam on the spacing plates in such a way that the stylus lies on the specified measuring points.



Measuring points, see diagram.

The stylus must not be positioned on the piston marking.

- Note the largest measured value.



- Select cylinder head gasket according to the largest piston projection measured.



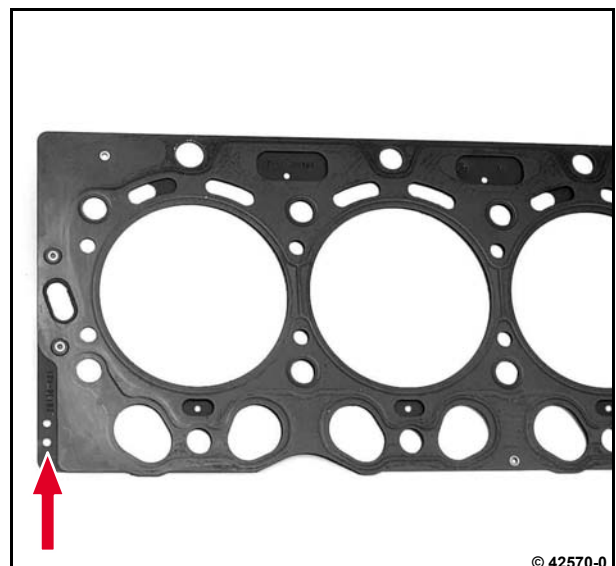
P02 75

P02 76

P02 77



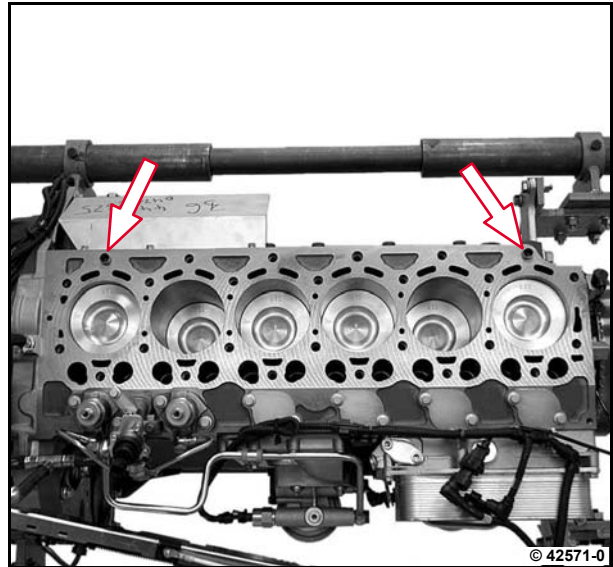
Example: Piston projection = **0.56 mm** corresponds to cylinder head gasket with **2 holes** (arrow).



Installing cylinder head



Make sure the clamping bushings (arrows) are in place.

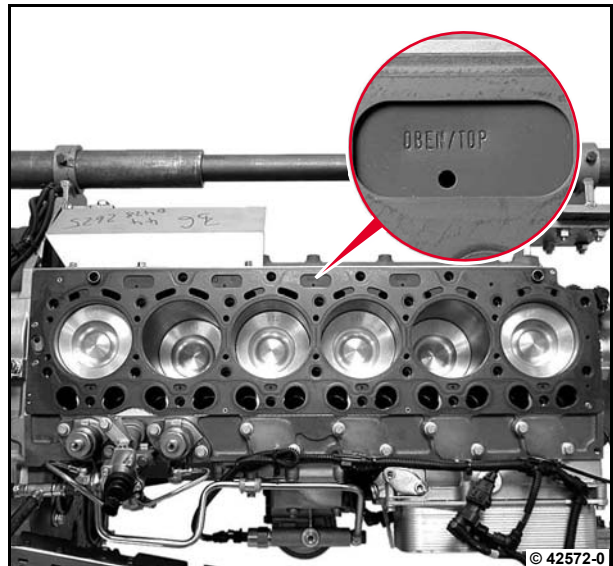


6

- Fit a new cylinder head gasket.



The sealing surfaces for the cylinder head gasket must be clean and free of oil.
The label **OBEN / TOP** must face towards the cylinder head.



- Mount cylinder head, lightly oil cylinder head screws and tighten slightly.

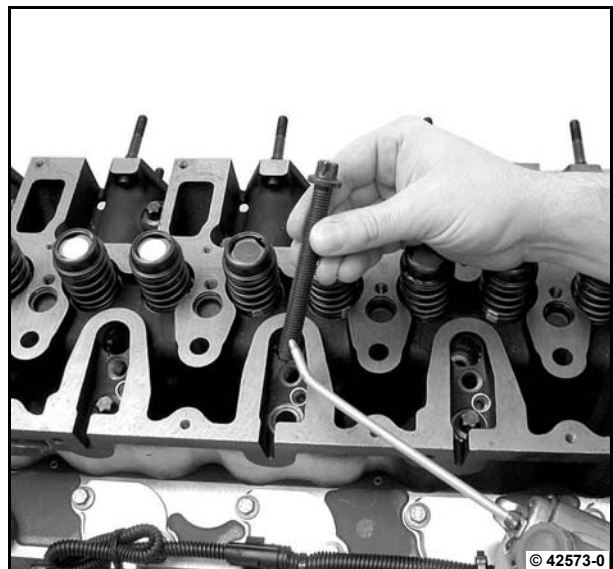


Attention!

Cylinder head screws can be used **max. 3 times** with written proof, otherwise renew every time they are loosened.



Use cylinder head screws M12 x 108 mm.
Do not tighten cylinder head screws.

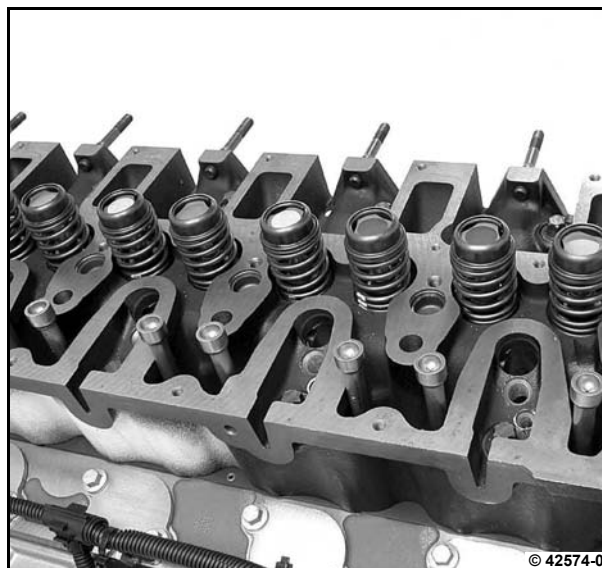


Installing rocker arm brackets

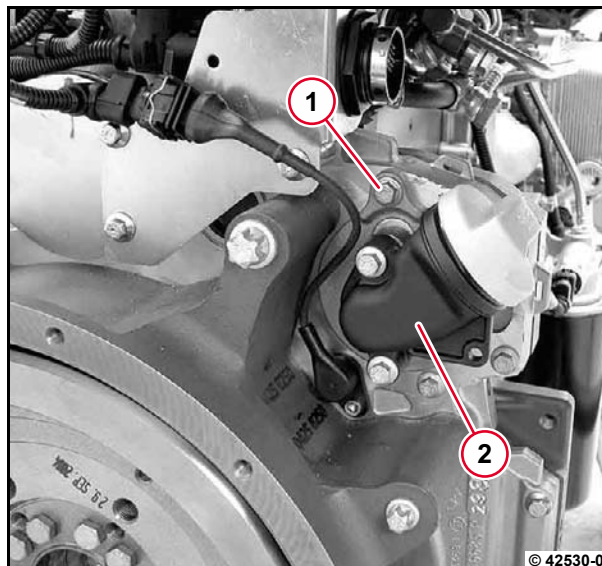
- Insert stop rods.



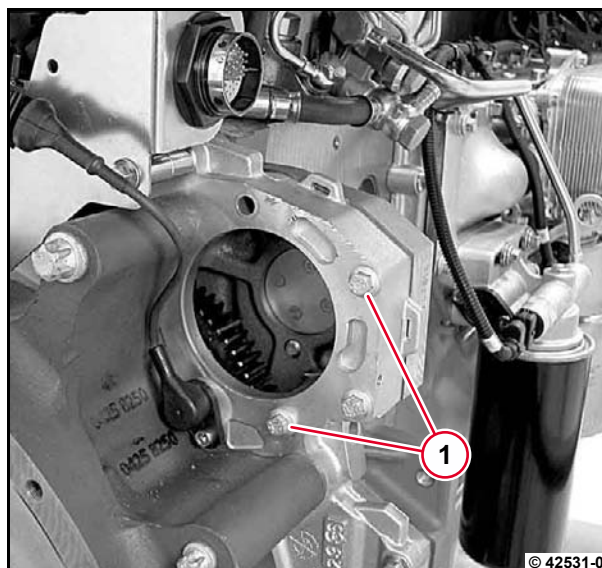
Note the assignment of the stop rods.
The stop rod must be seated with the ball head in the ladle of the tappet.



- Unscrew screw (1), remove cover (2) with oil filler neck.



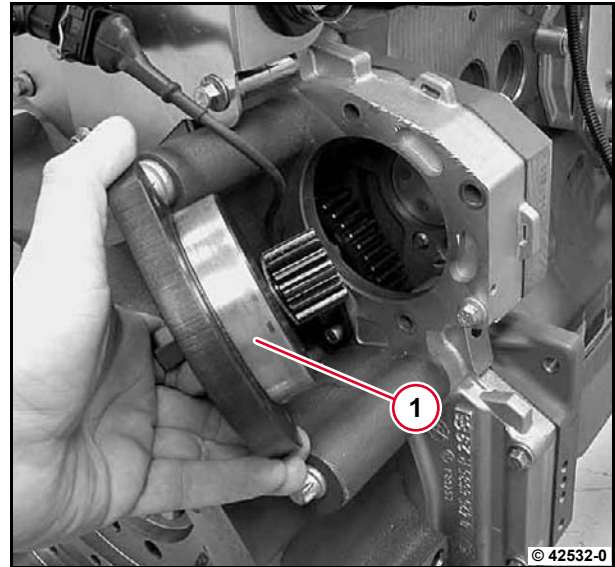
- Unscrew screws (1).



- Insert turning gear (1).

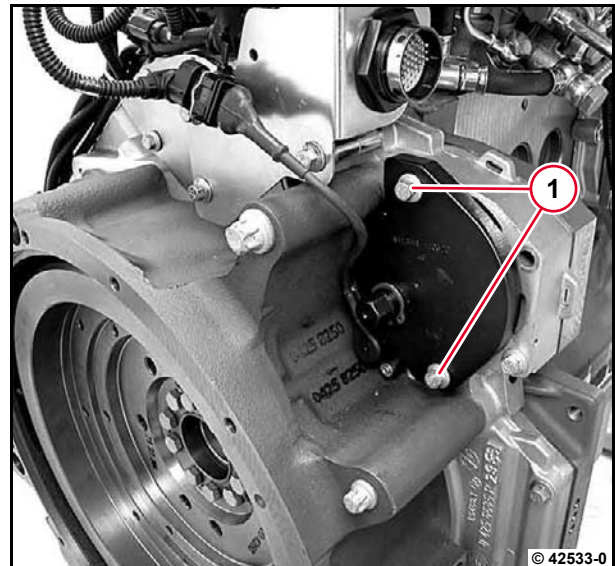


The gear wheel of the turning gear must grip the teeth of the camshaft gear wheel.

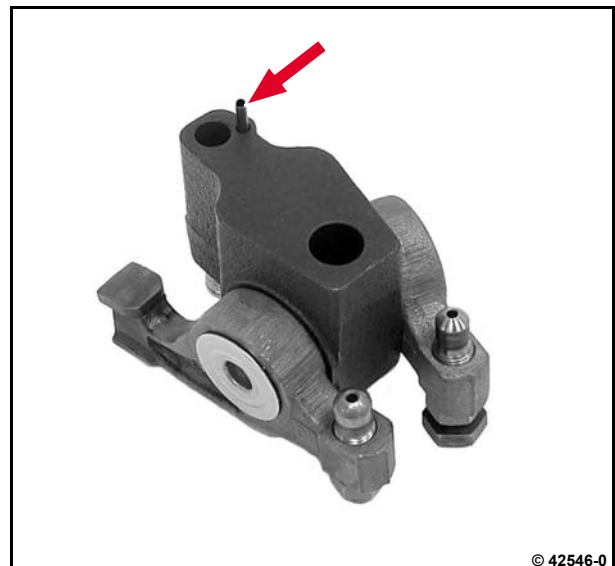


6

- Tighten screws (1).



Make sure the clamping pin (arrow) is in place.

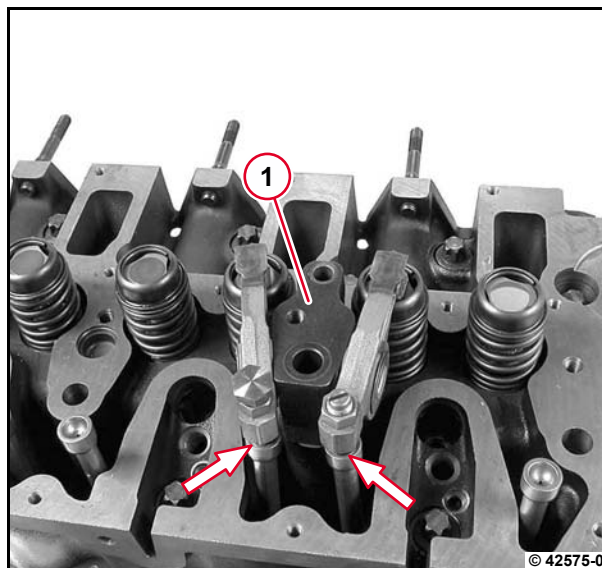


- Mount rocker arm bracket (1).



The clamping pin must grip the fit bore in the cylinder head.

The ball heads must be seated in the ladders of the stop rods (arrows).

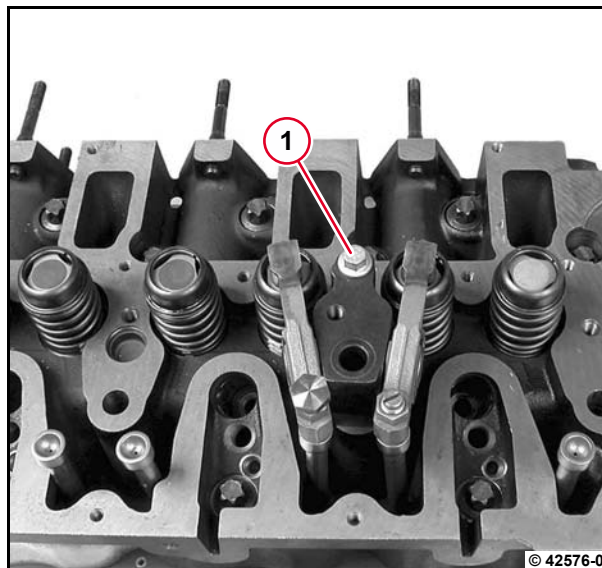


- Fasten screw (1).



Use M8 x 60 mm screw.

Do not tighten screw.



- Lightly oil cylinder head screw (1) and tighten slightly.

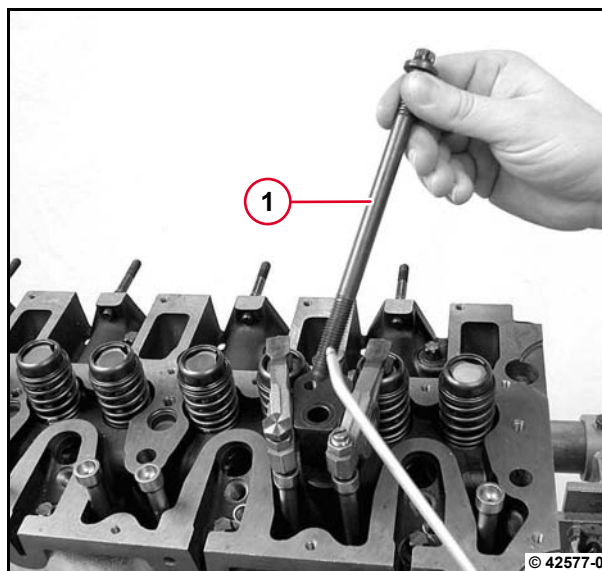


Attention!

Cylinder head screws can be used a **max. 3 times** with written proof, otherwise renew every time they are loosened.



Do not tighten cylinder head screw.



- Align rocker arm bracket symmetrically with the valve axes.
- Tighten screw (1).

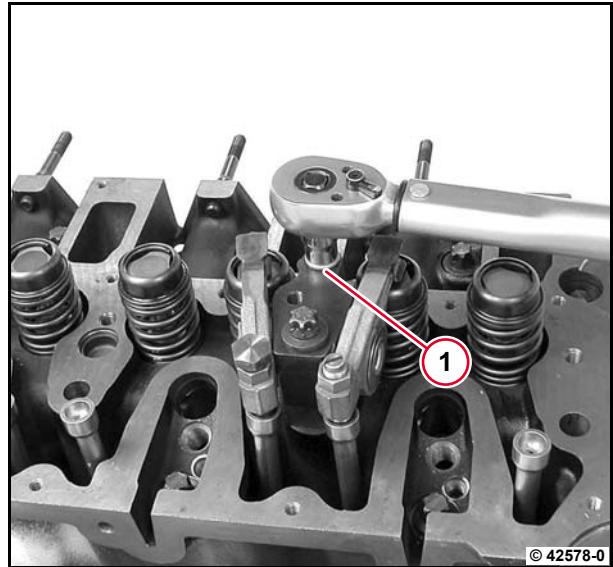


A01 002



Attention!

Make sure that the stop rods are not under stress due to valve overlap when tightening the screw.



6

- Tighten all screws according to the tightening sequence.

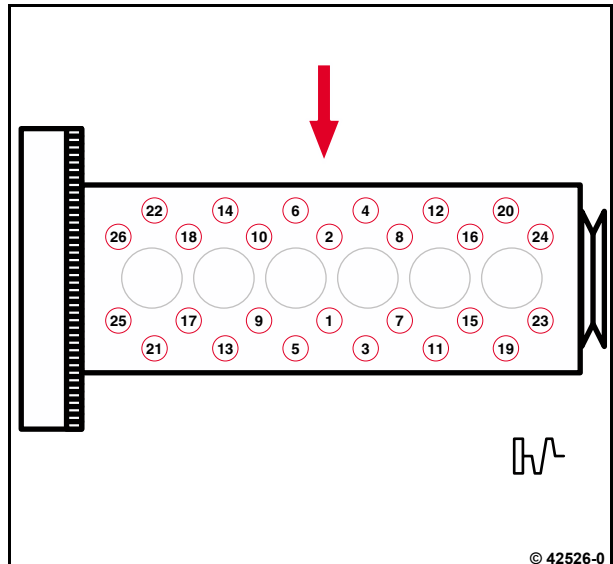


A01 001

●



Use socket wrench set.



- Unscrew screws (arrows).



Screw (1) remains installed.

- Set valve clearance (either with or without the exhaust gas return module removed).

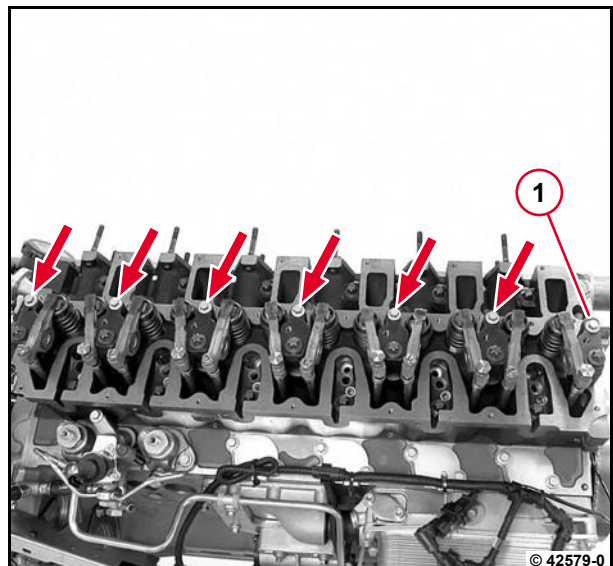


W 01-01-01

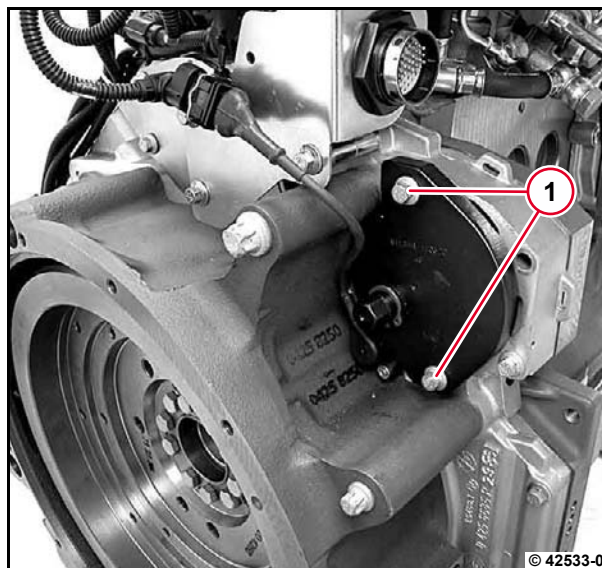
- Install exhaust gas return module.



W 06-09-01



- Unscrew screws (1) and remove turning gear.



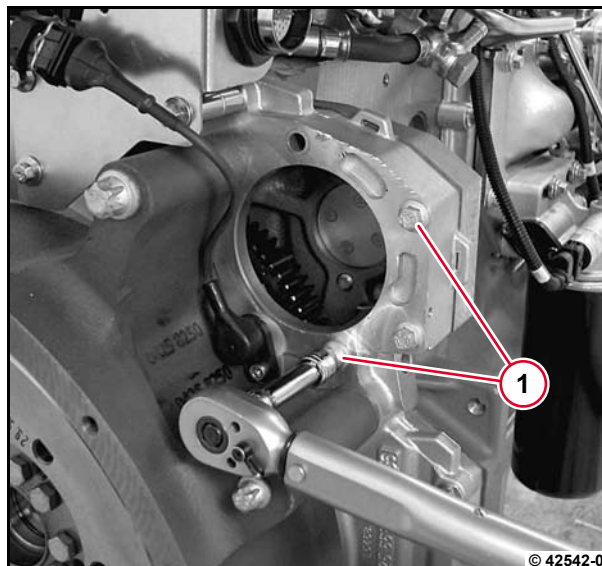
- Tighten screws (1).



A03 092



Use M8 x 45 mm screw.

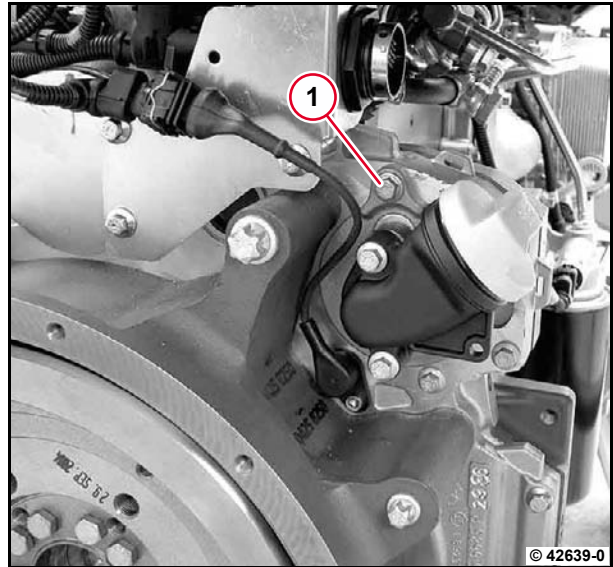


- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring.



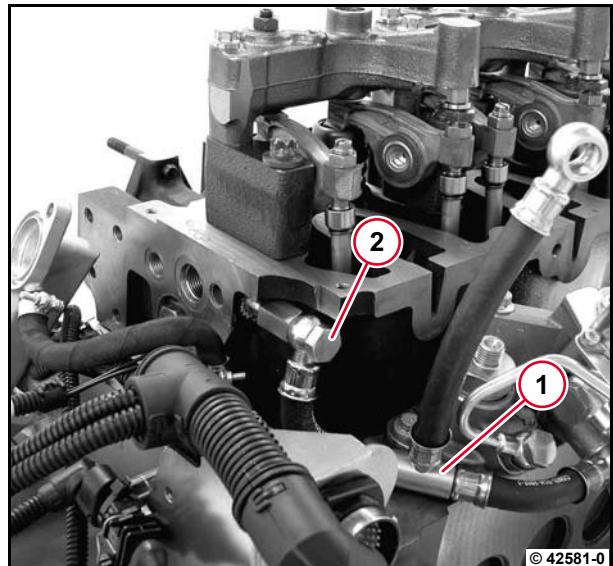
- Press in cover to stop and tighten screw (1).

 A04 022



- Install the fuel return line (1) and tighten hollow screw (2) with new sealing rings.

 A12 091



- Fit transport flange (1) and tighten screws (2).
- Assemble charge air line.

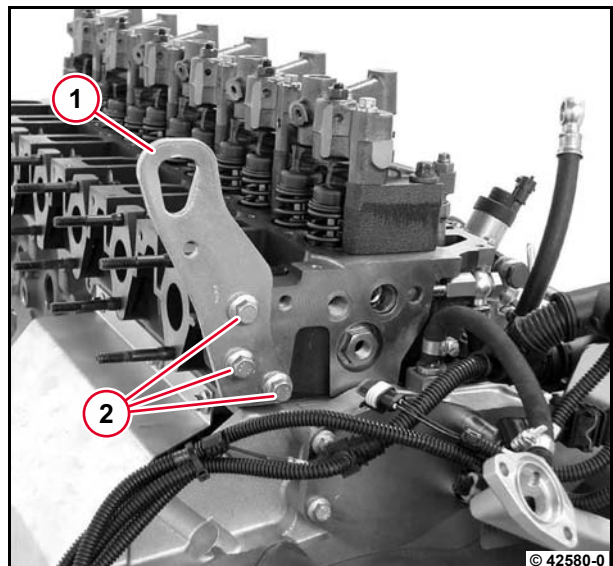
 W 06-07-03

- Install solenoid valve (exhaust return line).

 W 06-09-02

- Install rail.

 W 07-15-18



- Install heating plugs.

 [W 13-06-01](#)

- Plug in the cable plug (1).



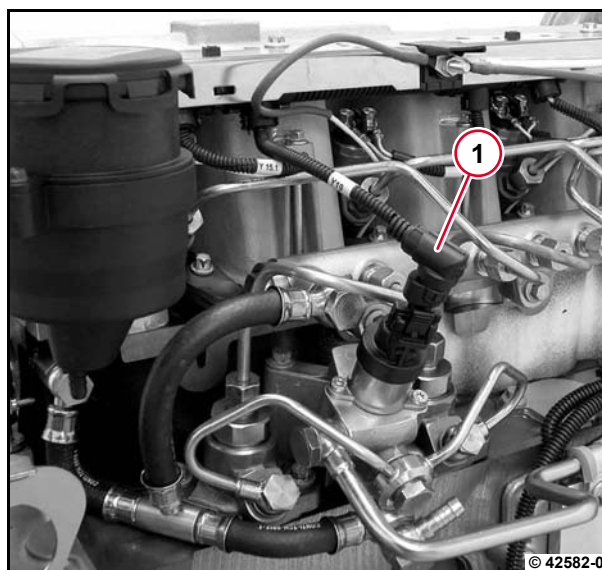
Ensure that the connection is perfect.

- Install exhaust manifold.

 [W 06-01-05](#)

- Install fan console.

 [W 09-13-03](#)



Removing and installing valves



Commercial available tools:

- Caliper gauge
- Assembly pliers. 8024
- Assembly lever 9017

Special tools:

- Support bracket 120 900
- Base plate. 120 910
- Assembly tool 121 410
- Assembly sleeves. 121 420



– W 01-04-04

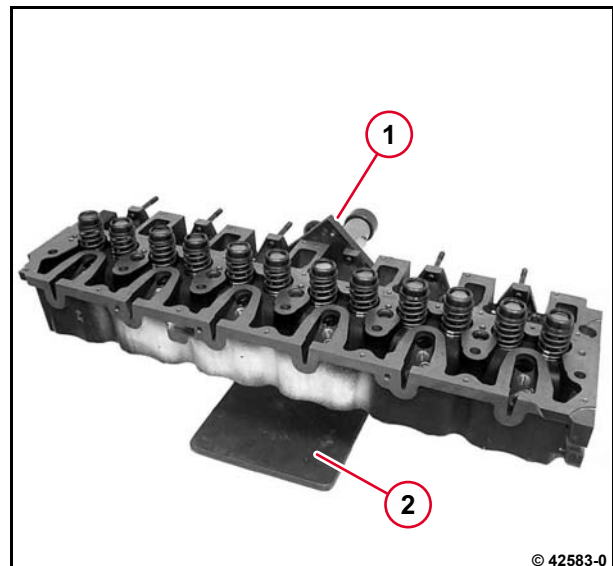
Removing valves

- Remove cylinder head.



W 01-04-04

- Mount support bracket (1) on base plate (2).
- Mount cylinder head on support bracket.



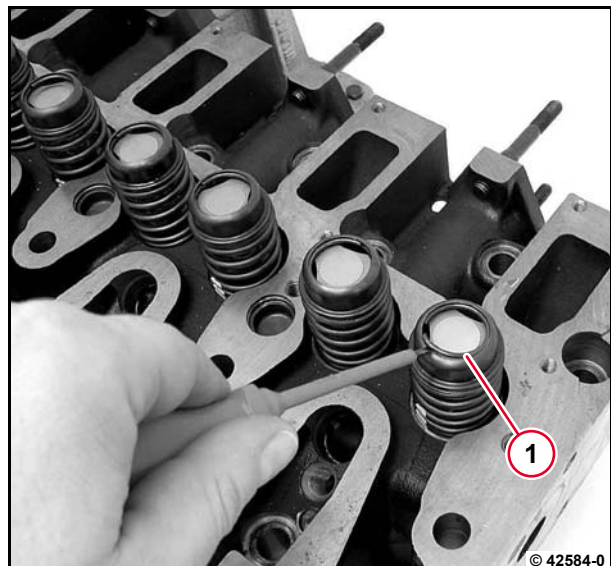
© 42583-0

- Remove snap ring (1).



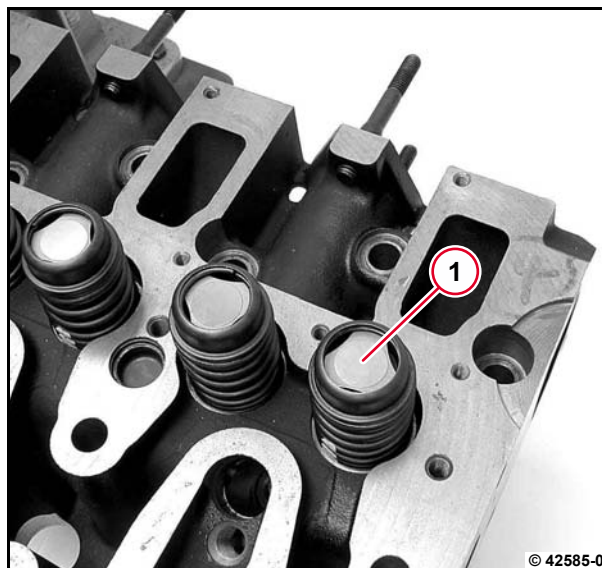
Danger!

Risk of injury! Snap ring springs off.

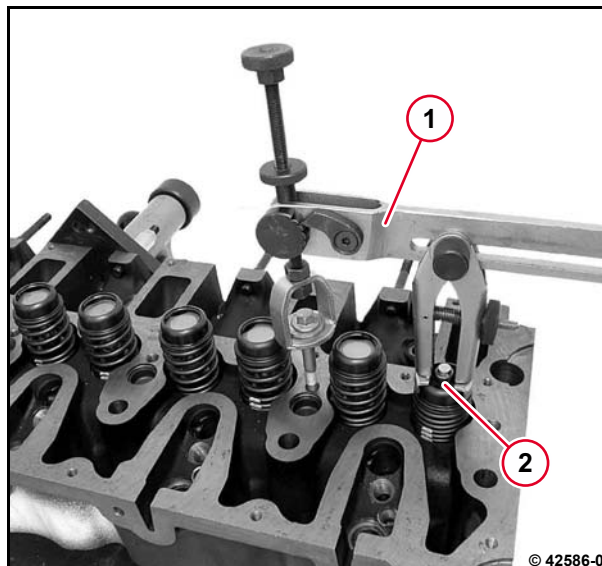


© 42584-0

- Remove thrust washer (1).



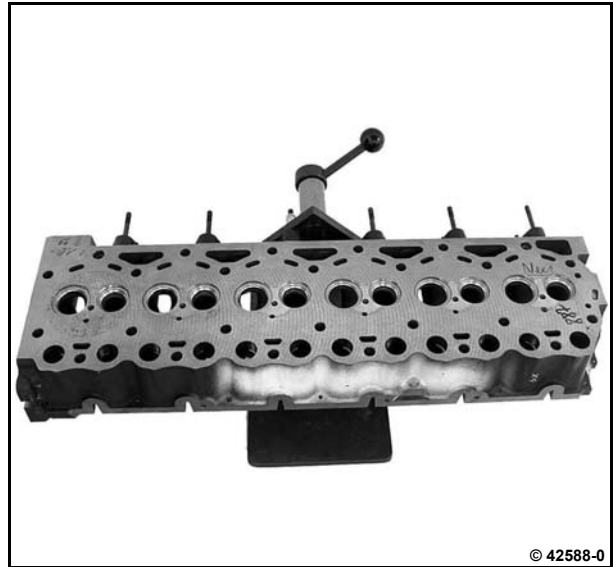
- Install assembly lever (1).
- Press down the valve spring with the assembly lever and remove both taper collets (2).
- Remove valve spring plates, valve springs and valves.
- Remove assembly lever.



- Disassemble valve stem seal with assembly pliers.



- Clean cylinder head, check.
- Visually inspect the components.



6

Installing valves

- Measure valve spring length with caliper gauge.



P01 51



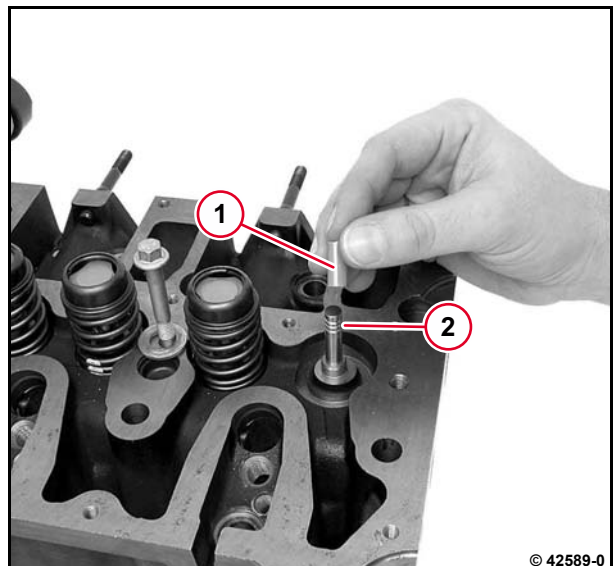
When the wear limit is reached the valve spring must be replaced.



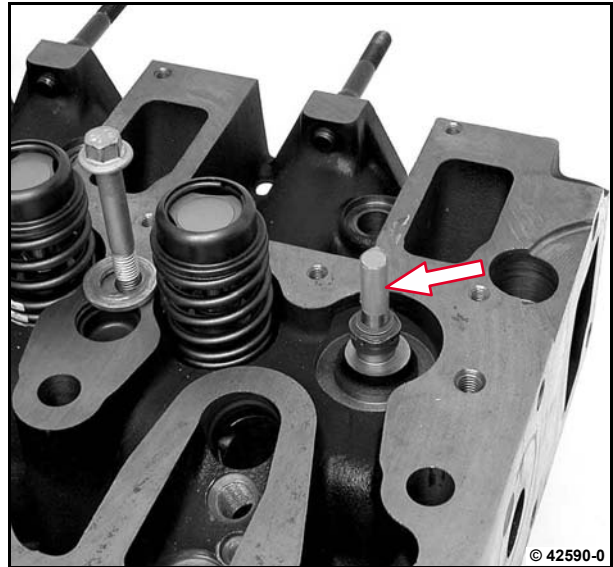
- Oil the valve stem slightly.
- Insert valve, hold tight and place the assembly sleeve (1) over the valve stem.



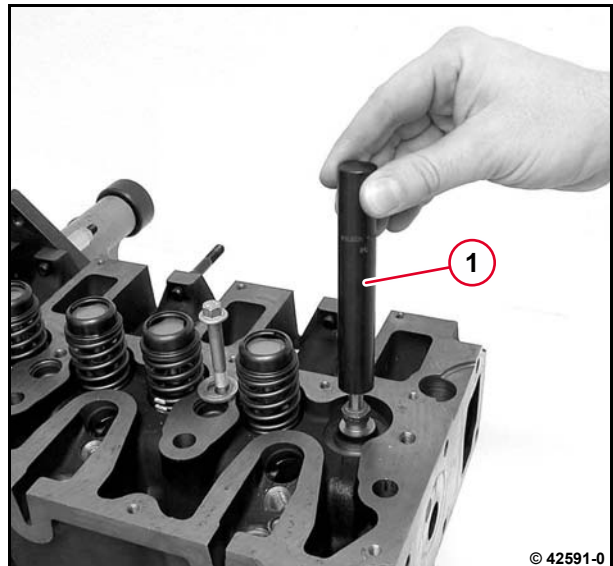
The valve keyway (2) must always be covered by the assembly sleeve (1) before installing the valve stem seal.



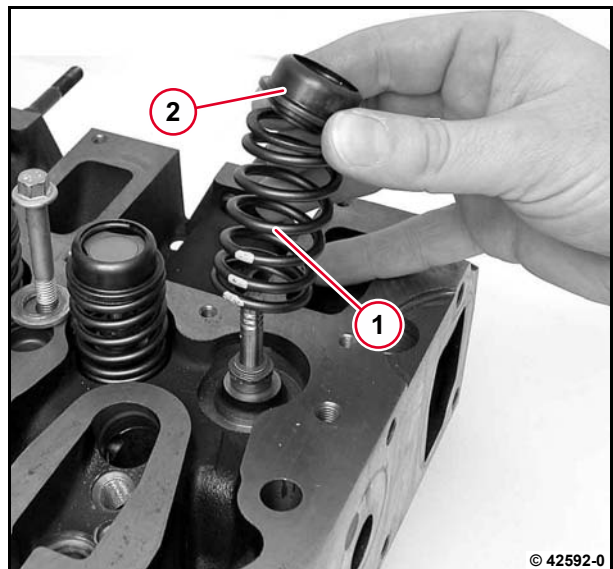
- Push the new valve stem seal over the assembly sleeve (arrow).



- Remove assembly sleeve.
- Press in the valve stem seal with the assembly tool (1) to the stop.



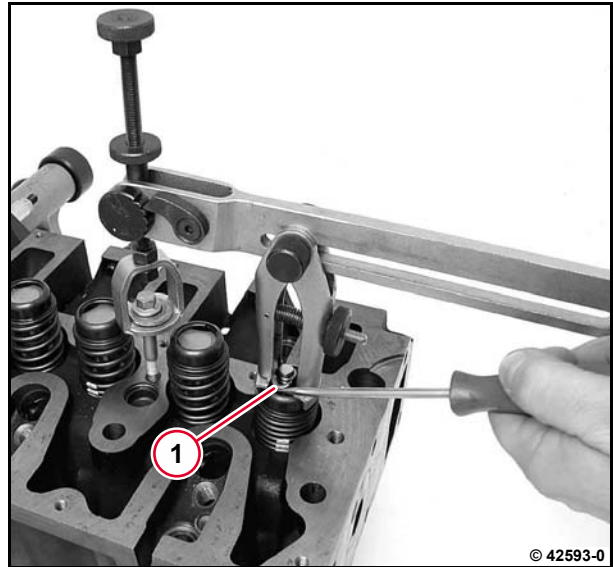
- Insert the valve spring (1) and valve spring plate (2).



- Install the assembly lever.
- Press down the valve spring with the assembly lever and insert both taper collets (1).

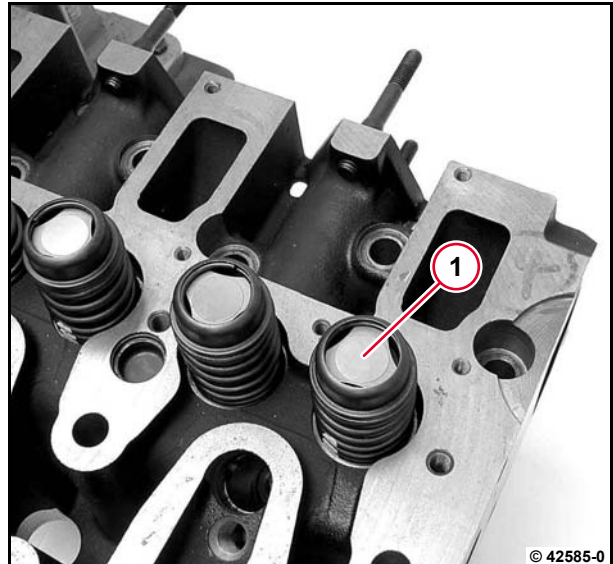


Make sure the taper collets fit correctly in the valve keyway.



6

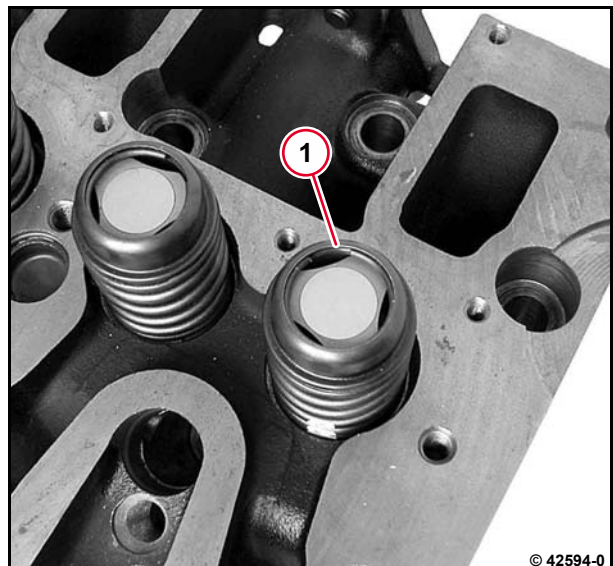
- Remove assembly lever.
- Insert thrust washer (1).



- Insert snap ring (1).

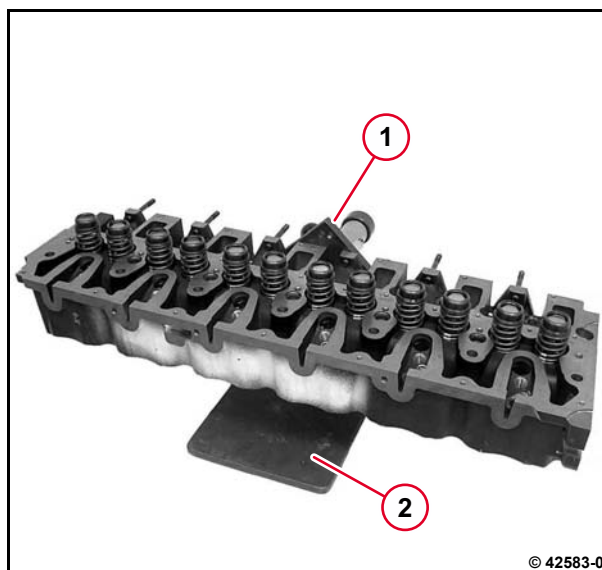


Make sure the snap ring fits correctly in the groove.



- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Install cylinder head.

 [W 01-04-04](#)



Checking valves



Commercial available tools:

- Micrometer gauge
- Caliper gauge



– W 01-05-01



Clean all valves.

When the wear limit is reached the valve must be replaced.

Valve stem diameter

- Dismantle valves.



W 01-05-01

- Measure the diameter of the valve stem with the micrometer gauge.



P01 31

P01 32



© 42182-1

Valve edge thickness

- Measure thickness of valve edge with caliper gauge.



P01 35

P01 36



© 42183-1

Valve head diameter

- Measure the diameter of the valve head with the caliper gauge.



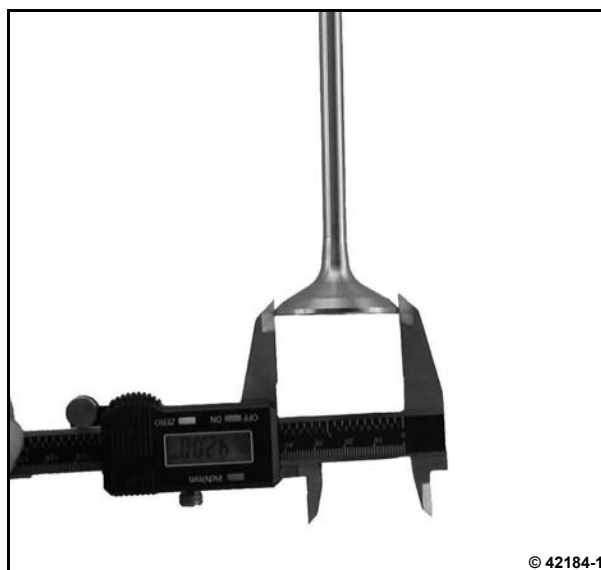
P01 37

P01 38

- Install valves.



W 01-05-01



© 42184-1

Checking valve guide



Commercial available tools:

- Magnetic measuring stand

Special tools:

- Dial gauge. 100 400



– W 01-05-01



New valves are used for testing.

When the wear limit is reached the valve guide must be replaced.

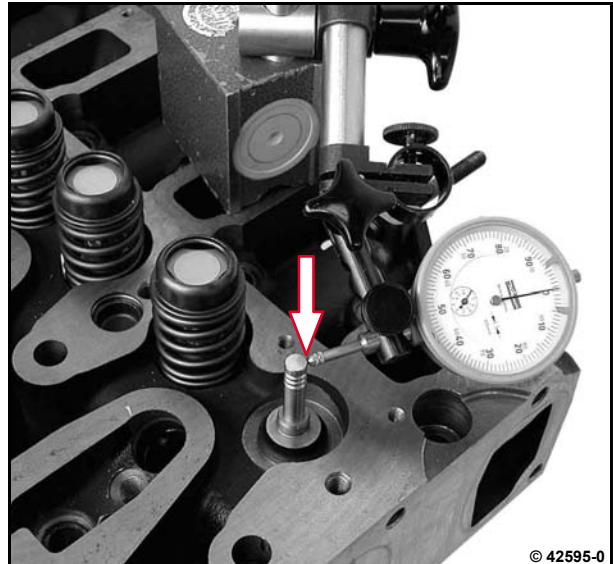
Checking the valve guide

- Dismantle valves.



W 01-05-01

- Visually inspect valve guide for wear.
- Attach magnetic measuring stand and insert dial gauge.
- Insert new valve.
- Apply stylus to the valve stem with pre-tension (arrow) and set dial gauge to **zero**.



© 42595-0

Measuring valve stem clearance

- Move the end of the valve stem back and forth in direction of arrow.

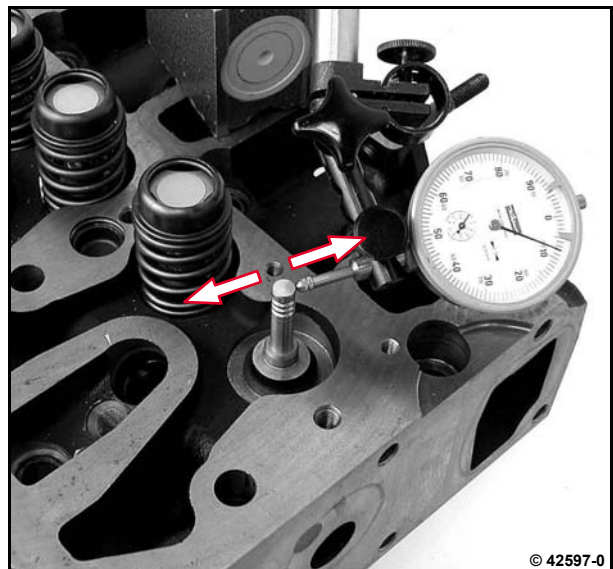


P01 33

P01 34



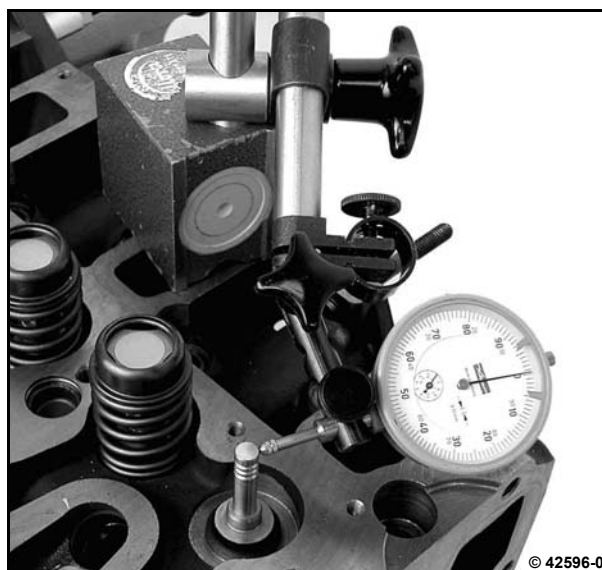
The whole tilting distance must be taken into consideration.



© 42597-0

- Remove magnetic measuring stand and dial gauge.
- Install valves.

 [W 01-05-01](#)



Checking valve lag



Commercial available tools:

- Depth-measuring appliance

Special tools:

- Support bracket120 900
- Base plate.120 910



– W 01-04-04



Attention!

If the wear limit is reached, the valve seat insert and/or the valve must be changed, either individually or both together.

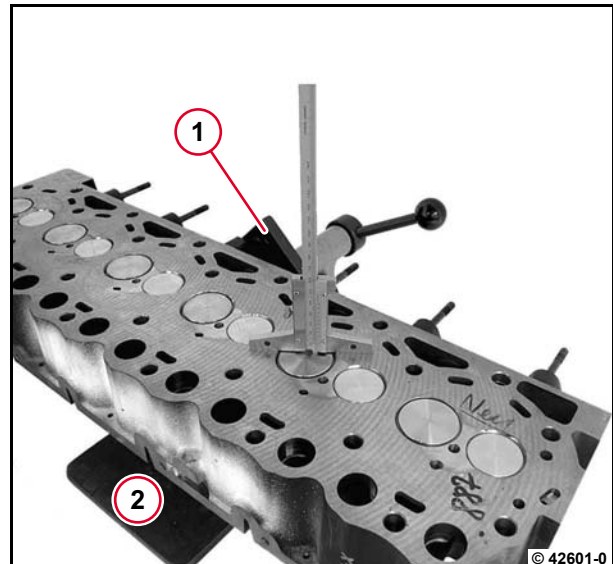
Checking the valve lag

- Remove cylinder head.



W 01-04-04

- Mount support bracket(1) on base plate (2).
- Mount cylinder head on support bracket.

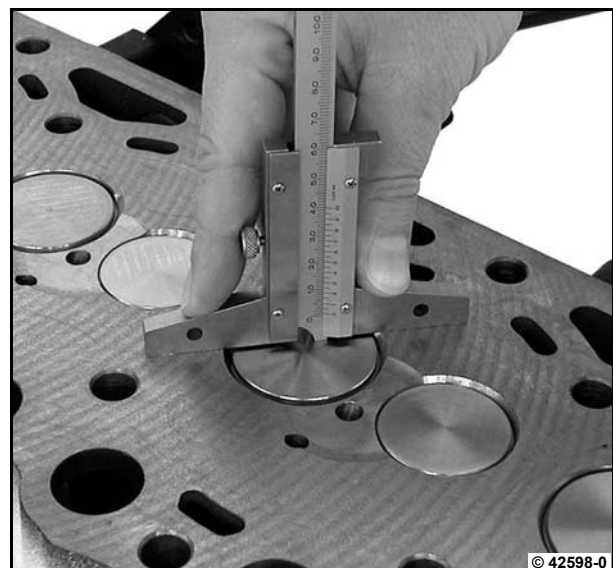


- Measure the valve lag with the depth measuring appliance from the valve head to the cylinder head sealing surface.



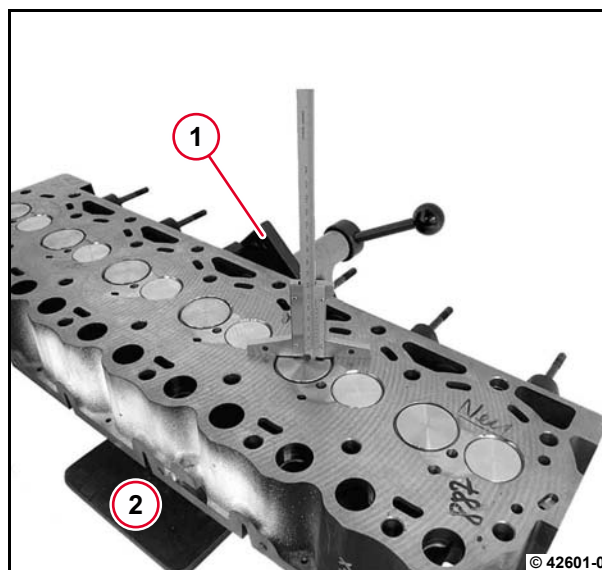
P01 45

P01 46



- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Install cylinder head.

 [W 01-04-04](#)



Checking the crankshaft



Commercial available tools:

- Magnetic measuring stand
- Micrometer gauge
- Internal measuring device
- Prisms
- Hardness tester

Special tools:

- Meter. 100 400



– W 02-04-01



The rework steps are labelled on the outside contour of the flywheel-side crankshaft web.

H = ground main bearing pin

P = ground con rod bearing pin

If the crankshaft is worn, it is possible to have it repaired in our Service Center.

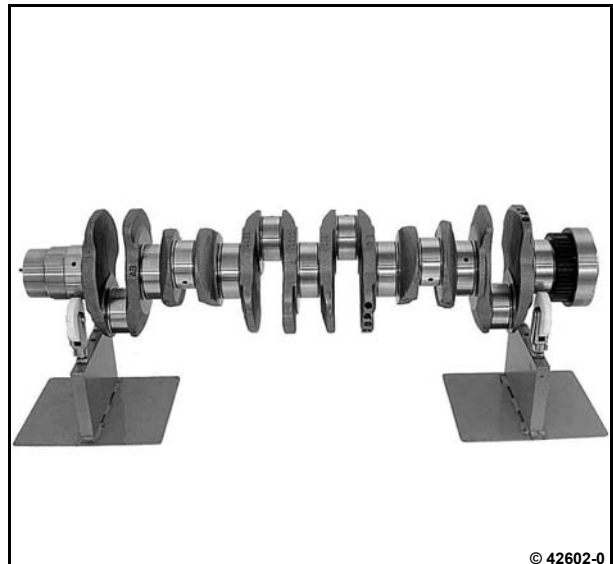
Checking the bearing pin hardness

- Dismantle crankshaft.



W 02-04-01

- Place crankshaft on prism.



© 42602-0

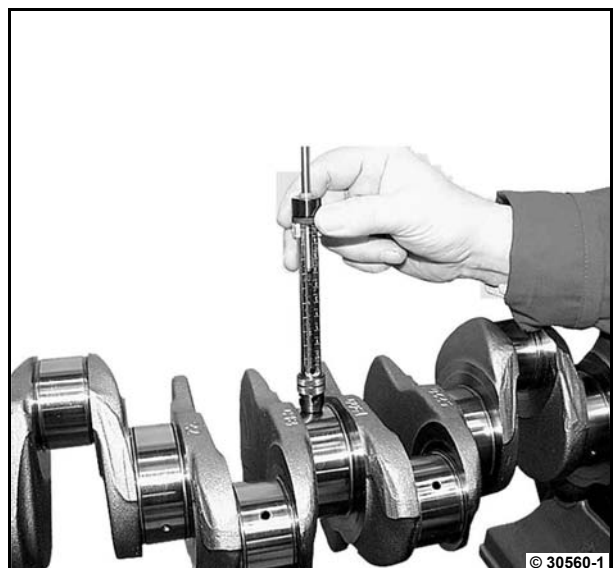
- Check bearing pins with hardness tester.



P02 07



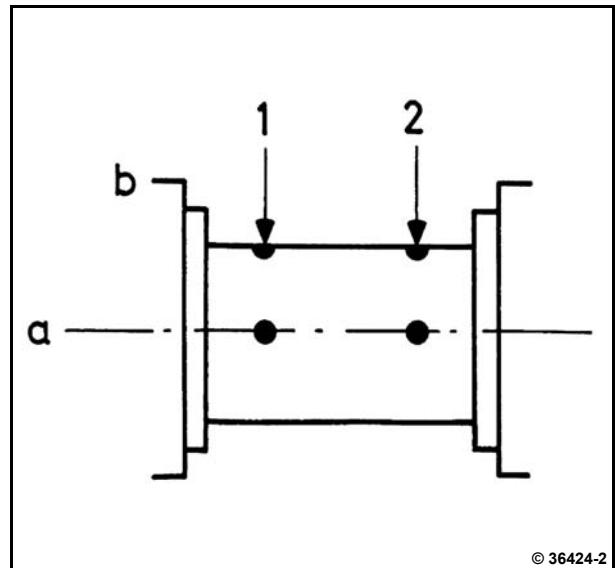
The measured value is to be converted according to the table of the measuring device.



© 30560-1



Diagram for measuring the bearing pins at the points (1 and 2) in the levels (a and b).



© 36424-2

Checking the diameter of the main bearing pins

- Measure main bearing pins with micrometer gauge.

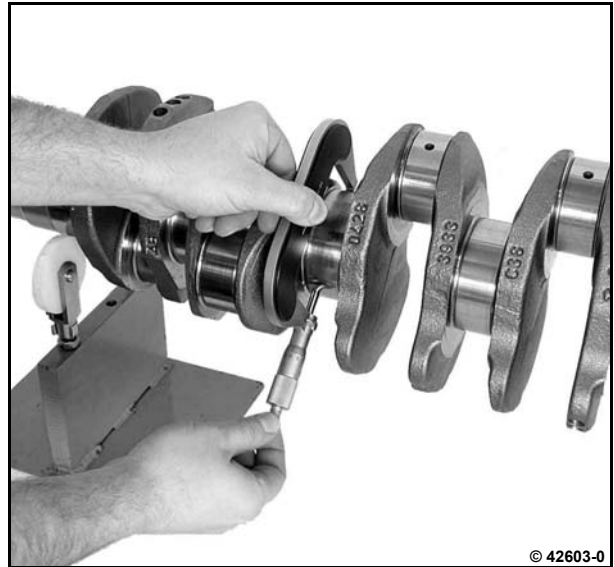


P02 03

P02 04



For measuring points, see diagram.



© 42603-0

Checking the diameter of the lifting journals

- Measure lifting journals with micrometer gauge

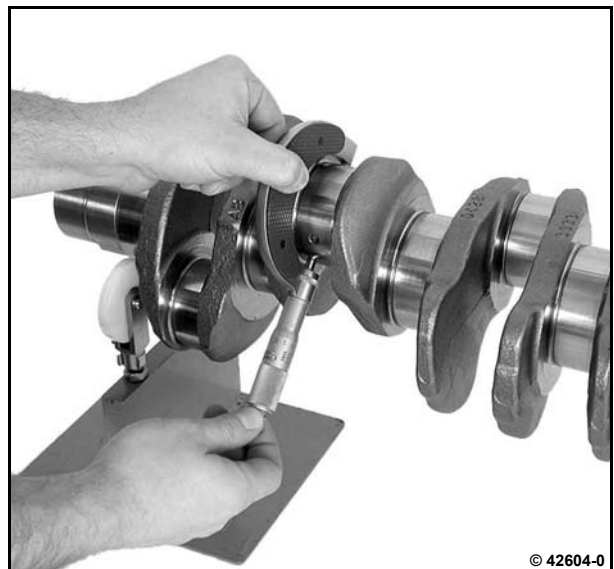


P02 22

P02 23



For measuring points, see diagram.



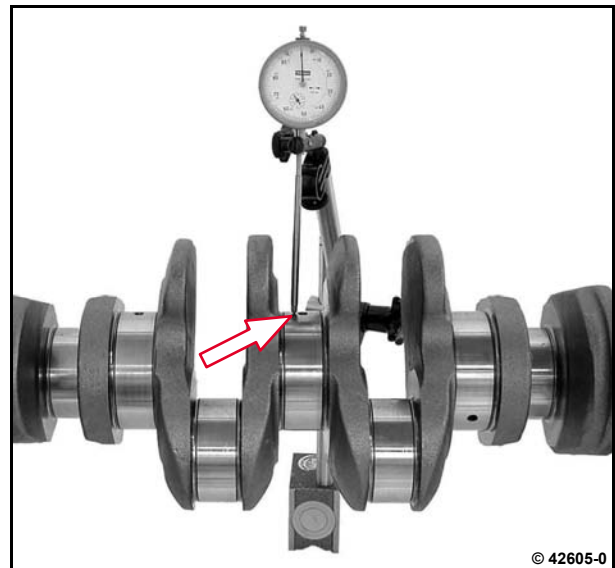
© 42604-0

Checking the rotation

- Attach magnetic measuring stand and insert meter.
- Apply stylus to the main bearing pin with pre-tension (arrow) and set meter to **zero**.
- Turn crankshaft evenly and check rotation.

 P02 26

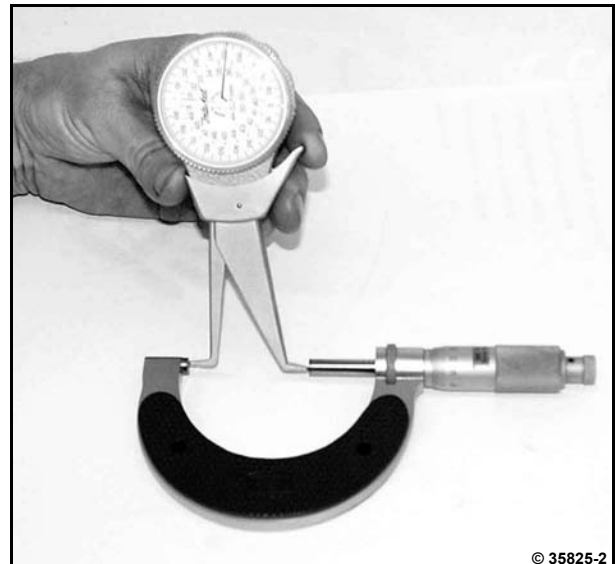
- Remove magnetic measuring stand and meter.



6

Measuring the fit bearing width

- Set micrometer gauge to **32 mm**.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to **zero**.



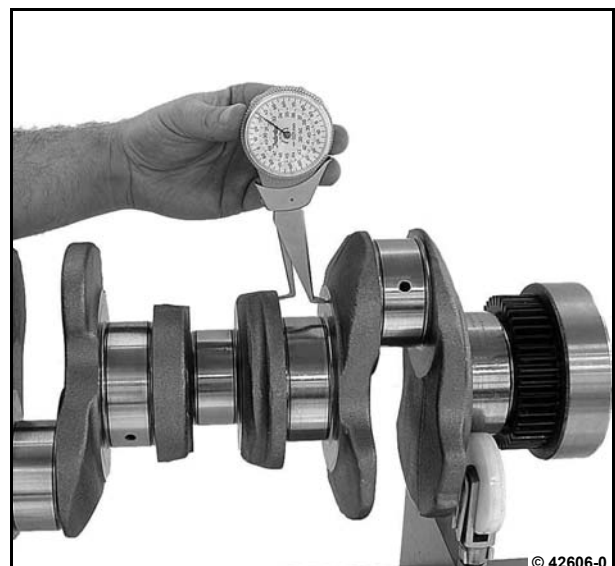
- Measure fit bearing width with internal measuring device between the contact surfaces of the wearing rings.
- Note the measured value, dimension (a).

 P02 11

P02 12



The dimension (a) is required to determine the axial bearing clearance.

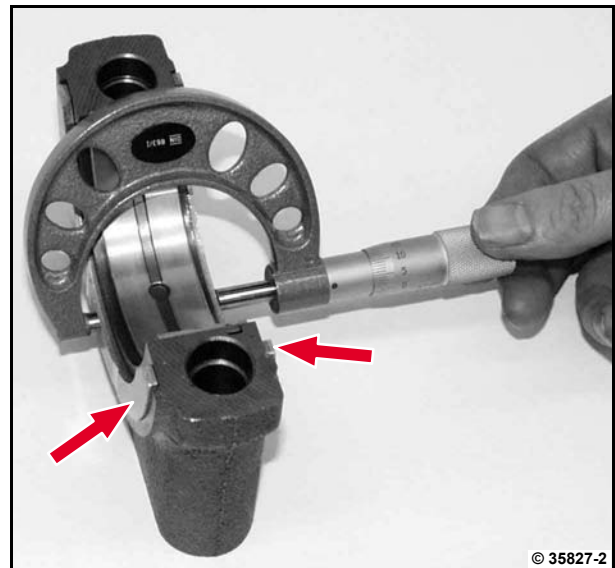


Checking the axial bearing clearance

- Place wearing ring halves on bearing caps (arrows).
- Measure width with micrometer gauge.
- Note the measured value, dimension (b).



The dimension (b) is required to determine the axial bearing clearance.



- Determine the axial bearing clearance.



P02 34



Use appropriate wearing ring halves (arrows).



P02 35,

P02 36

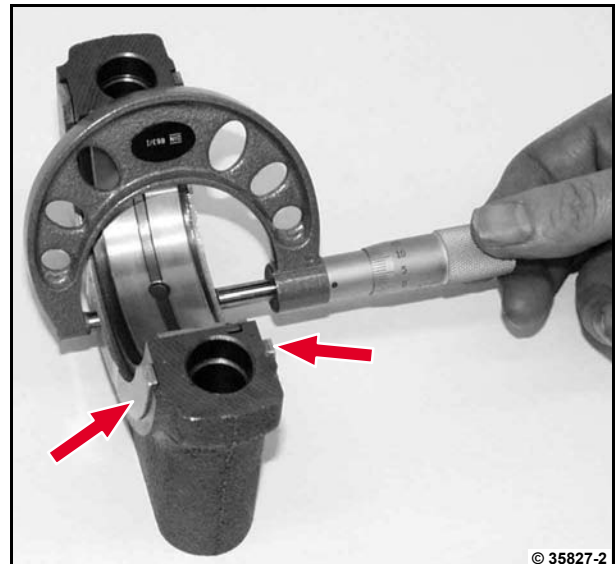
Calculation example

Desired: Axial bearing clearance

Given:

Measured: (a) = 32.2 mm
(b) = 32.1 mm
Dimension (a) - Dimension (b)

Result: = 0.1 mm

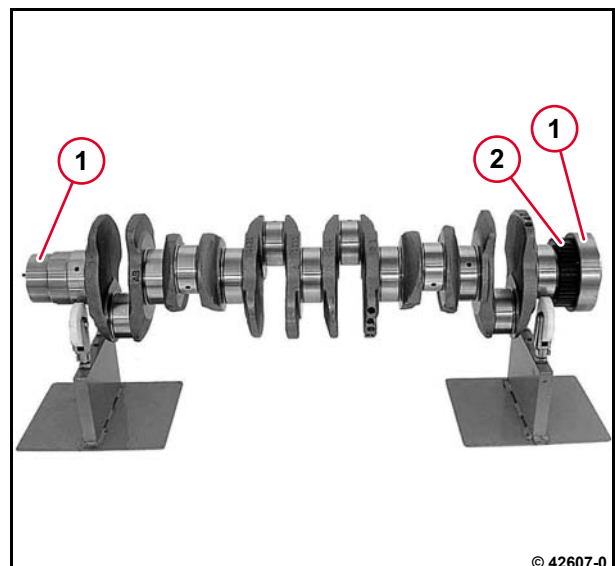


Visual inspection

- Visually inspect running surfaces (1) of the shaft sealing rings and gear wheel (2).
- Install crankshaft.



W 02-04-01



Renewing the crankshaft sealing ring (flywheel side)



Commercial available tools:

- Pricker 8198
- Assembly lever 9017

Special tools:

- Assembly tool 142 830



– W 12-06-01



- Self-tapping screw
- Washer

Remove crankshaft sealing ring

- Remove flywheel.



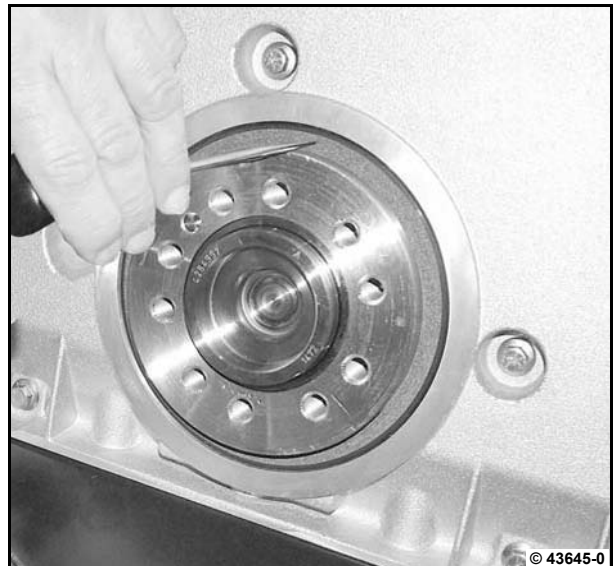
W 12-06-01

- Make a hole (approximately 3 mm Ø) in the crankshaft sealing ring with a pricker.

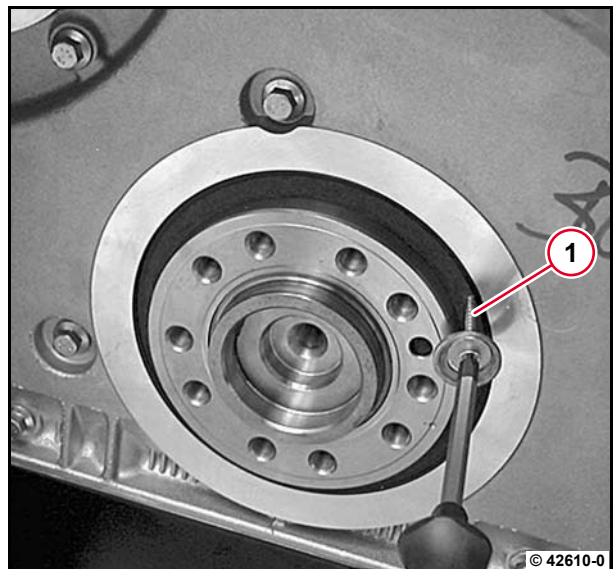


Attention!

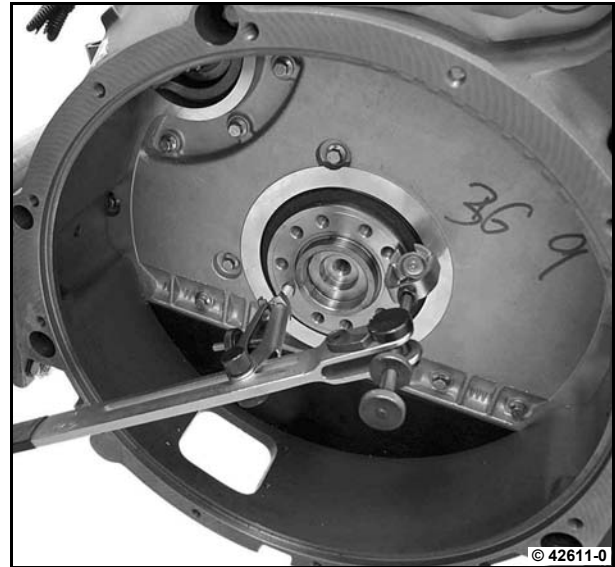
Do not damage the gearcase cover and crankshaft.



- Screw in self-tapping screw (1) with washer.



- Remove crankshaft sealing ring with suitable tool, e.g. assembly lever.
- Visually inspect the running surface of the crankshaft flange and gearcase.

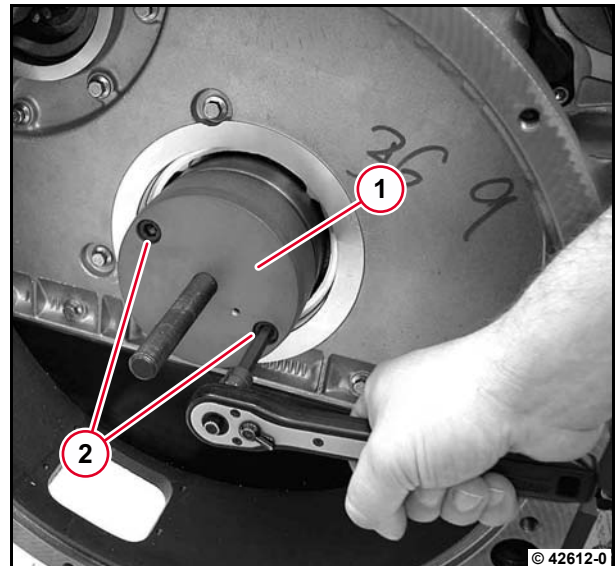


Installing the crankshaft sealing ring

- Fit guide sleeve (1) and tighten screws (2) slightly.



The holes in the guide sleeve must match the threaded holes in the crankshaft flange.



- Oil the sealing lip of the crankshaft sealing ring lightly.
- Place the crankshaft sealing ring carefully on the running surface.



The sealing lip must be facing the crankshaft.

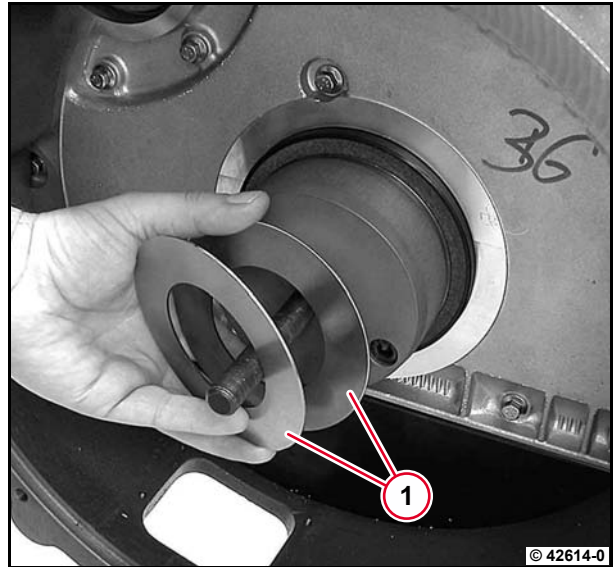


- Mount spacing washers (1).



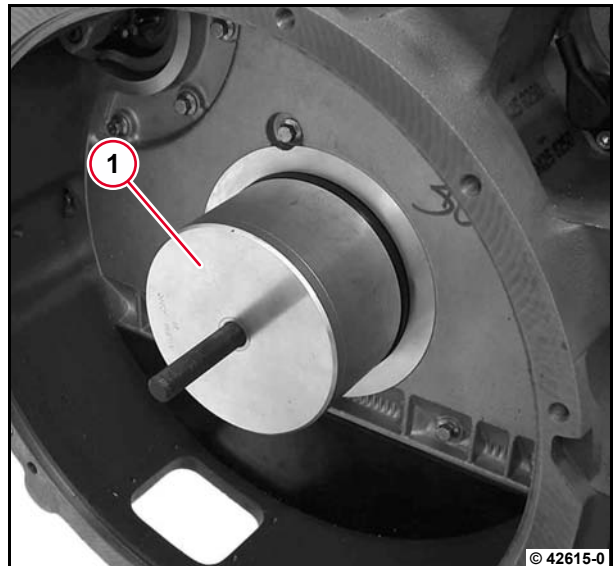
If the crankshaft flange has a run-in groove, it is possible to mount the crankshaft sealing ring at three installation depths:

- first-time installation = 2 washers
- 1st repair - installation step = 1 washer
- 2nd repair - installation step = 0 washers.

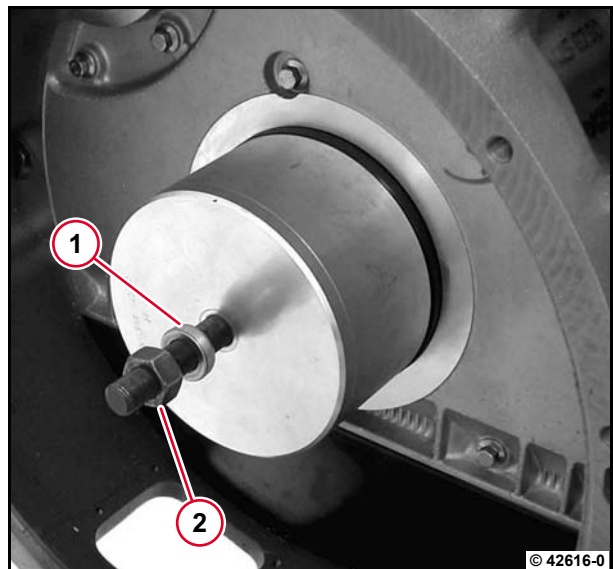


6

- Fit assembly sleeve (1) and press down onto the crankshaft sealing ring until it is touching.



- Fit bearing (1) and tighten nut (2).



- Screw on nut (arrow) until the assembly sleeve (1) is touching.

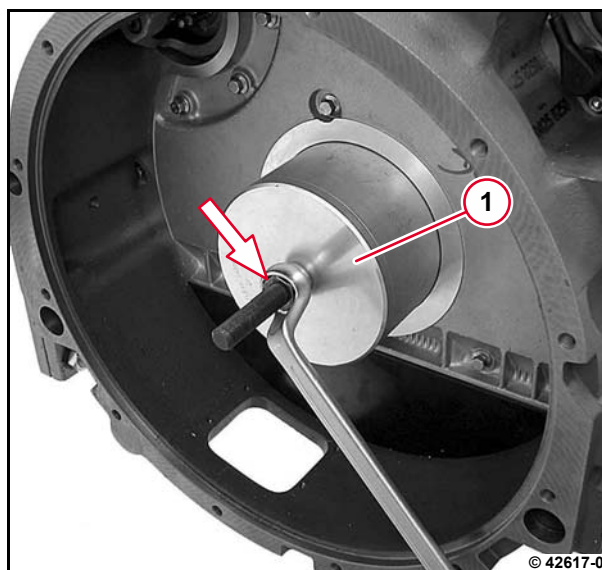


The crankshaft sealing ring is now at its pre-selected installation depth.

- Remove assembly tool.
- Assemble flywheel.



[W 12-06-01](#)



Renewing the crankshaft sealing ring (opposite side to flywheel)



Commercial available tools:

- Pricker 8198
- Assembly lever 9017

Special tools:

- Assembly tool 142 670



– W 12-01-04



- Self-tapping screw
- Washer

Removing the crankshaft sealing ring

- Remove torsional vibration damper.



W 12-01-04

- Make a hole (approximately 3 mm Ø) in the crankshaft sealing ring using a pricker.



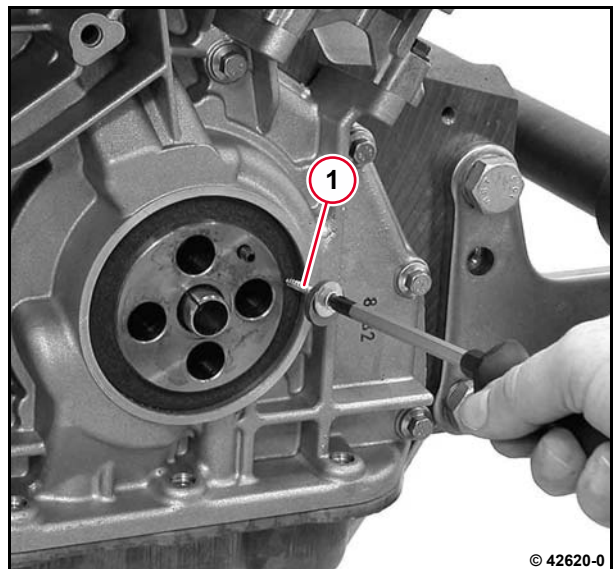
Attention!

Do not damage the front cover or crankshaft.



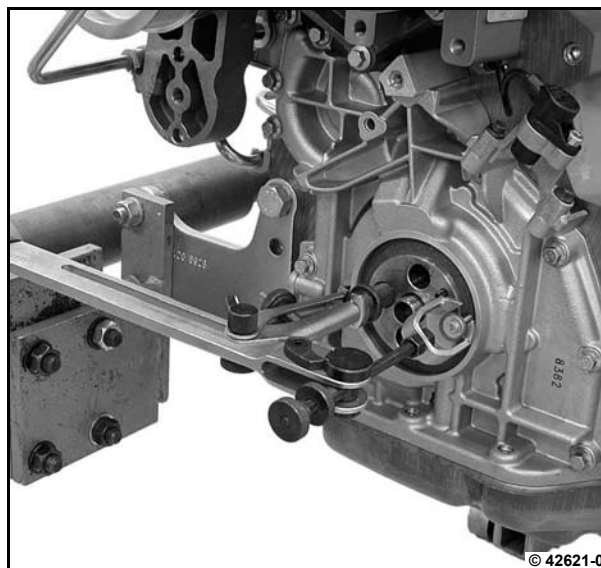
© 43643-0

- Screw in self-tapping screw (1) with washer.



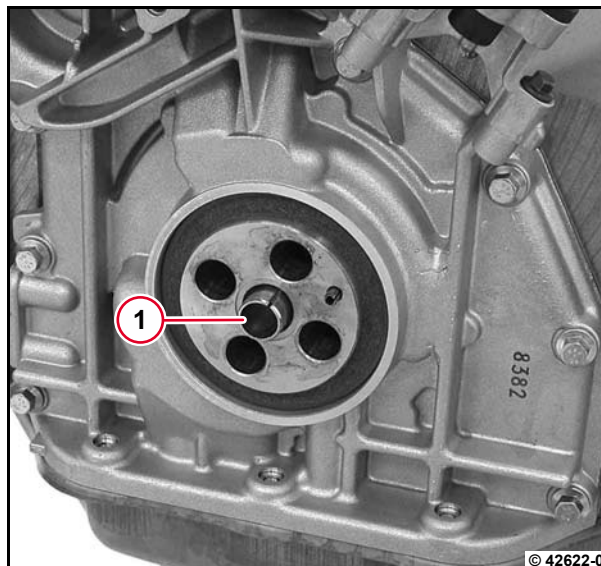
© 42620-0

- Remove crankshaft sealing ring with suitable tool, e.g. assembly lever.
- Visually inspect the running surface of the crankshaft flange and rear cover.



Install crankshaft sealing ring

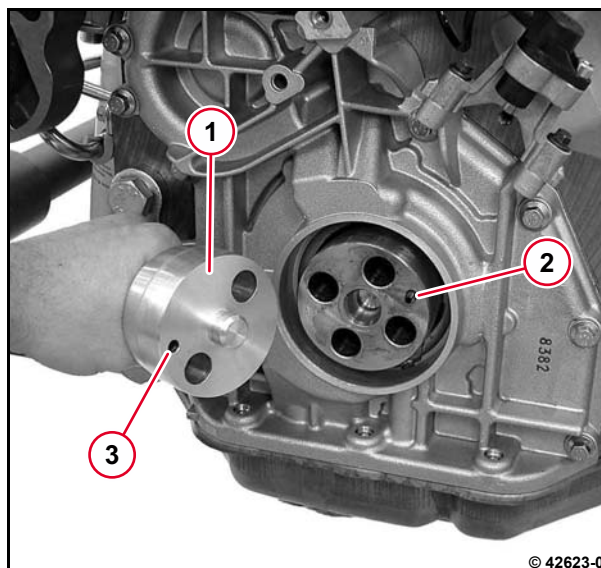
- Pull out clamping bushing (1).



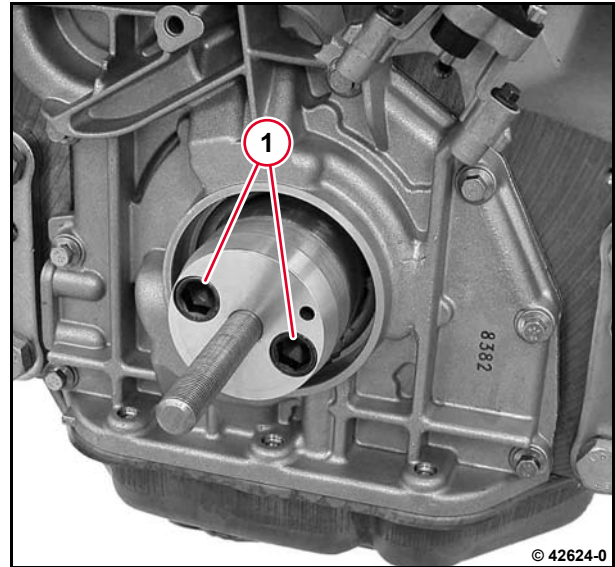
- Fit guide sleeve (1) onto crankshaft.



The clamping bushing (2) must grip in the hole (3).



- Tighten screws (1) lightly.

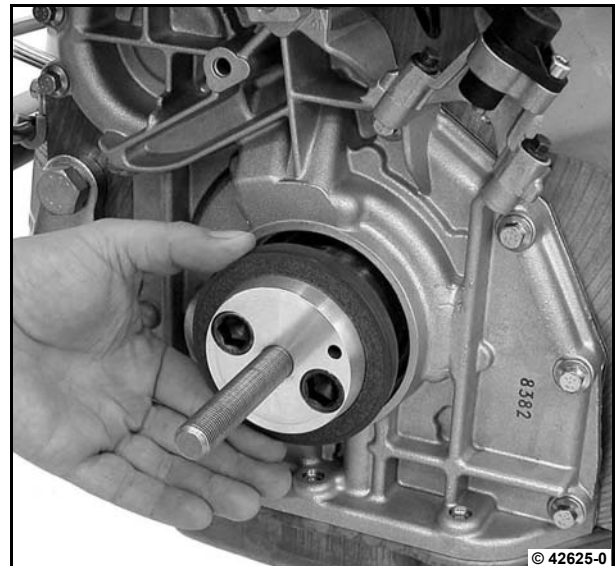


6

- Oil the sealing lip of the crankshaft sealing ring lightly.
- Place the crankshaft sealing ring carefully on the running surface.



The sealing lip must be facing the crankshaft.

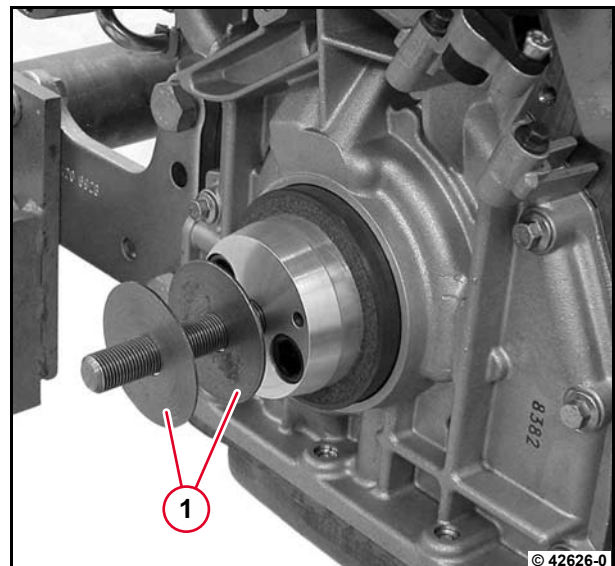


- Mount spacing washers (1).



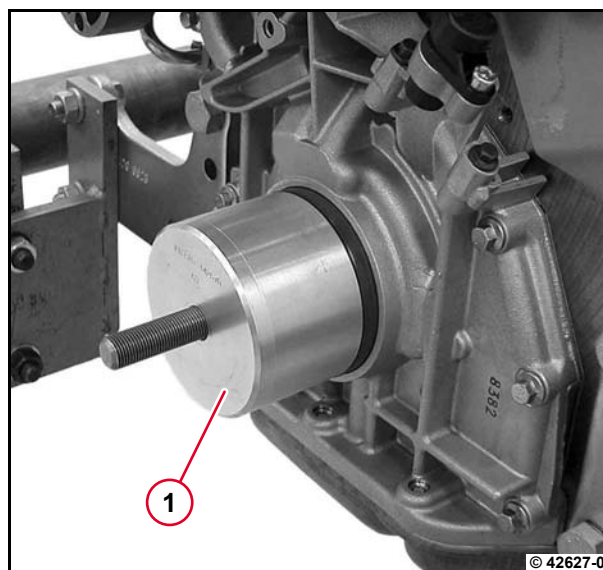
If the crankshaft flange has a run-in groove, it is possible to mount the crankshaft sealing ring at three installation depths:

- first-time installation = 2 washers
- 1st repair - installation step = 1 washer
- 2nd repair - installation step = 0 washers.

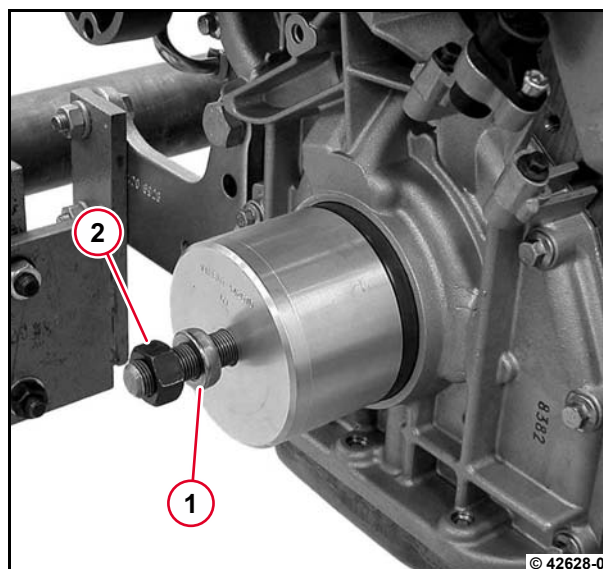


6

- Fit assembly sleeve (1) and press down onto the crankshaft sealing ring until it is touching.



- Fit bearing (1) and tighten nut (2).

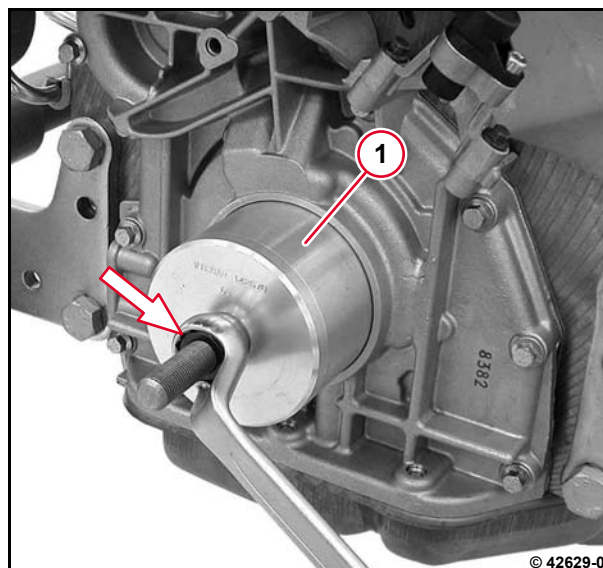


- Screw on nut (arrow) until the assembly sleeve (1) is touching.



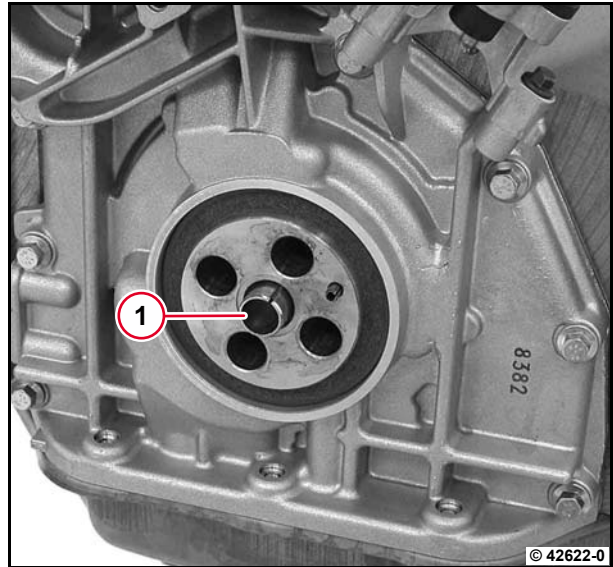
The crankshaft sealing ring is now at its pre-selected installation depth.

- Remove assembly tool.



- Knock in the clamping bushing (1) to the stop.
- Install torsional vibration damper.

 [W 12-01-04](#)



Checking the con rod



Commercial available tools:

- Micrometer gauge
- Internal precision measuring device
- Con rod test device

Special tools:

- Dial gauge. 100 400



Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the con rod bearing cover!



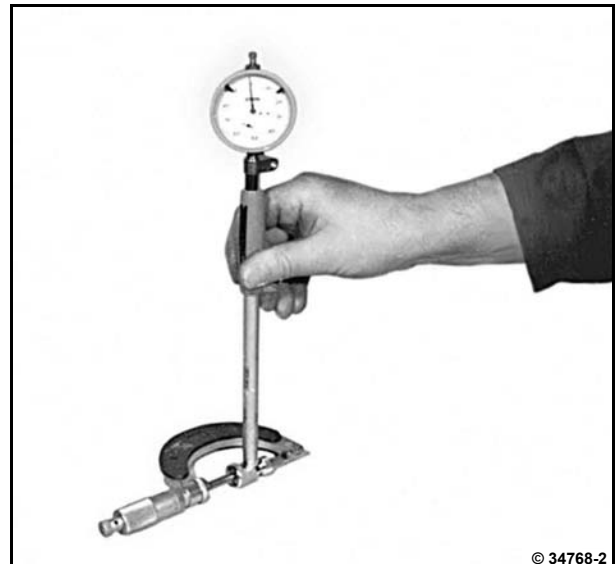
The con rod is removed and the piston dismantled.

6

Checking small end bush

● Prepare internal precision measuring device

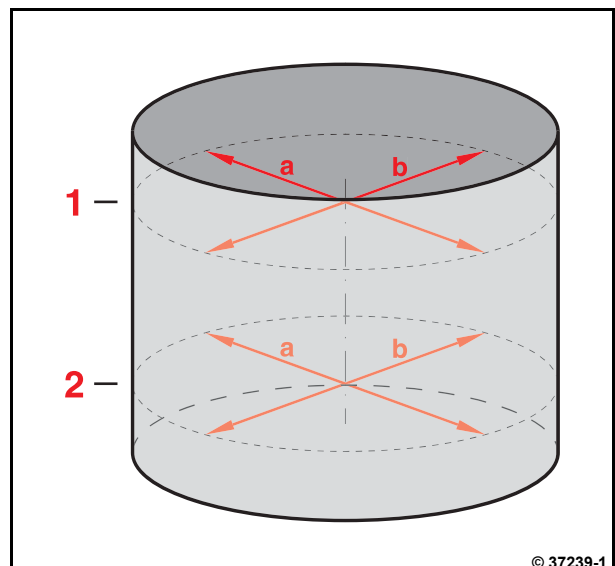
- Mount probe bolt for the appropriate measuring range in the internal precision measuring device.
- Mount dial gauge with **approx. 1 mm** pre-tension in the internal precision measuring device.
- Set micrometer gauge to **39 mm**.
- Balance the internal precision measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to **zero**.



© 34768-2



Diagram for measuring the piston bolt liner at the points (a and b) in the levels (1 and 2).



© 37239-1

- Insert internal precision measuring device in the small end bush.
- Balance the internal precision measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



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Small end bush pressed in.
For measuring points, see diagram.

- Note the measured value, dimension (A).



The dimension A is required to determine the piston bolt clearance.



Checking diameter of the piston bolt

- Measure piston bolt with micrometer gauge.



P02 61

- Note the measured value, dimension B.



The dimension B is required to determine the piston bolt clearance.



Determining piston bolt clearance

- The piston bolt clearance is given by the difference between the internal diameter of the small end bush (dimension A) and the piston bolt diameter (dimension B).



P02 45

Calculation example

Desired:	Piston bolt clearance
Given:	
Measured:	(A) = 40.045 mm
	(B) = 40.006 mm
	Dimension (A) - Dimension (B)
Result:	= 0.039 mm

Checking the con rod bearing bore

- Mount con rod bearing cover on con rod.

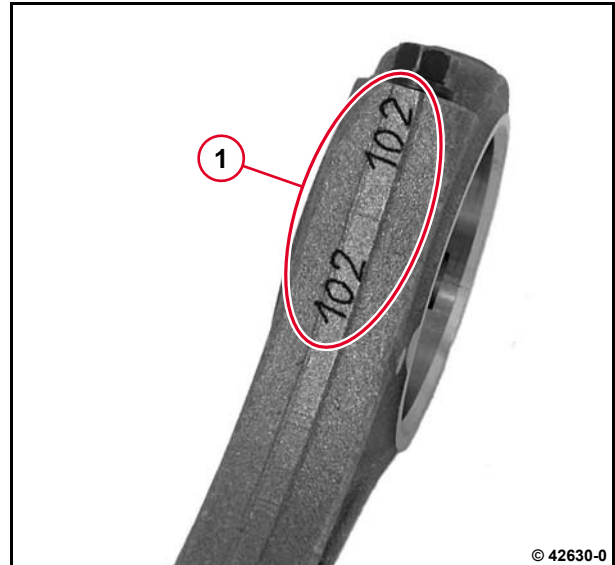


The identification numbers (1) on the con rod and the con rod bearing cover must be identical and opposite to each other when assembled.



Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless! Do not damage the break areas of the con rod and the con rod bearing cover!



6

- Tighten screws.



A02 020



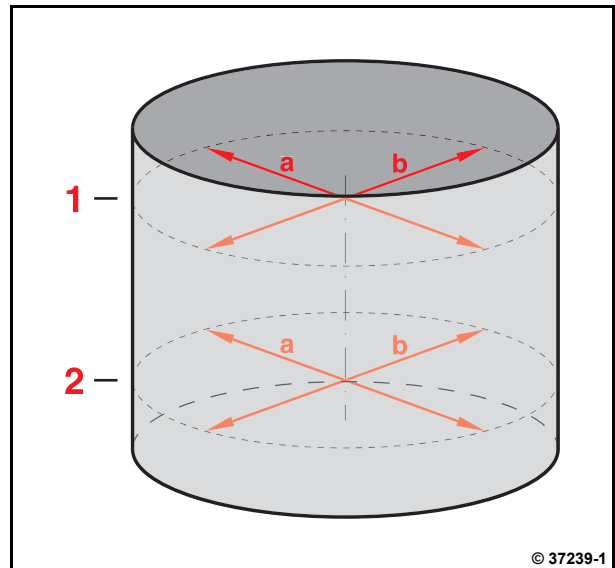
- Prepare internal precision measuring device

- Mount probe bolt for the appropriate measuring range in the internal precision measuring device.
- Mount dial gauge with **approx. 1 mm** pre-tension in the internal precision measuring device.
- Set micrometer gauge to **73 mm**.
- Balance the internal precision measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to **zero**.





Diagram for measuring the con rod bearing bore at the points (a and b) in the levels (1 and 2).



© 37239-1

- Insert internal precision measuring device in the con rod bearing bore.
- Measure con rod bearing bore with internal precision measuring device.
- Balance the internal precision measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



P02 55

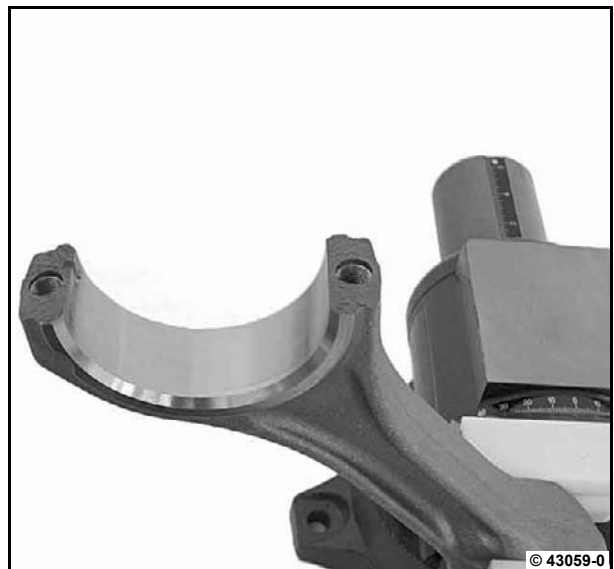


If the measured values deviate slightly, additional measurements must be made with new bearing shells.



© 42633-0

- Unscrew screws and remove con rod bearing cover



© 43059-0

Checking internal diameter of the con rod bearing shells

- Insert con rod bearing shell in the con rod.

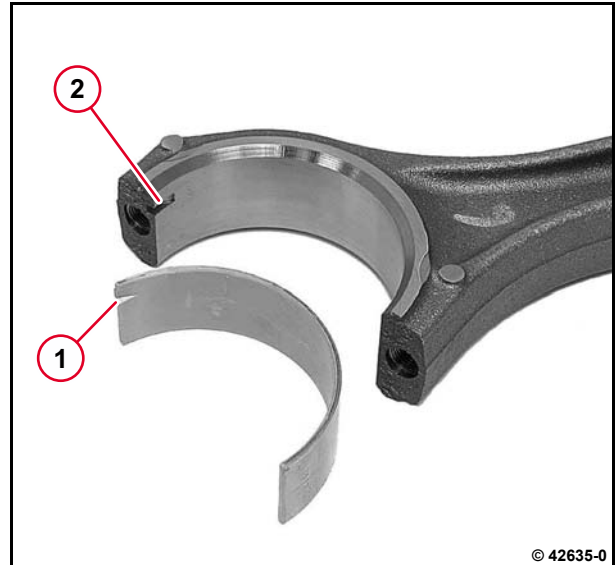


Check that the bearing shells are correctly assigned.
The anti-rotation lock (1) must lock in the groove (2).



Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!



- Insert con rod bearing shell in the respective con rod bearing cover.



The anti-rotation lock (1) must lock in groove (2).



- Mount con rod bearing cover on con rod.



The identification numbers (1) on the con rod and the con rod bearing cover must be identical and opposite to each other when assembled.



- Tighten screws.

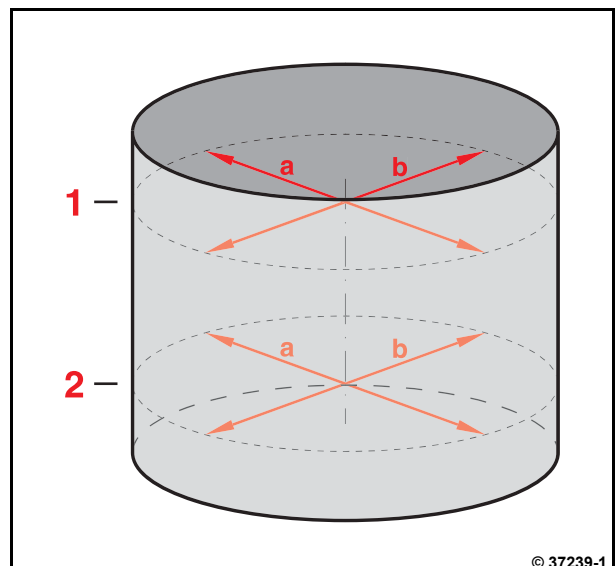
 A02 020



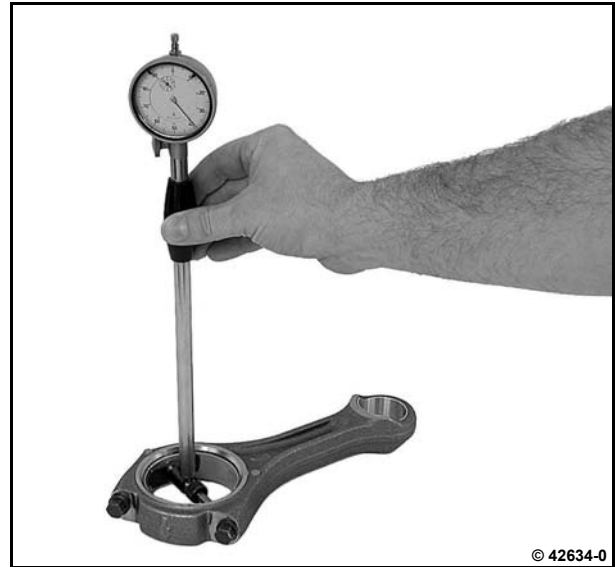
- Prepare internal precision measuring device
 - Mount probe bolt for the appropriate measuring range in the internal precision measuring device.
 - Mount dial gauge with **approx. 1 mm** pre-tension in the internal precision measuring device.
 - Set micrometer gauge to **70 mm**.
 - Balance the internal precision measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to **zero**.



Diagram for measuring the inside diameter of the con rod bearing shells at the points (a and b) in the levels (1 and 2).



- Measure inside diameter of the con rod bearing shells with internal precision measuring device.
- Insert the internal precision measuring device between con rod bearing shells.



6

- Balance the internal precision measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



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If the values are up to a **max. 0.015 mm** above the bearing tolerances, the con rod can remain in use.
The con rod must be changed if the limit has been reached.

- Note the measured value, dimension (C).



The dimension (C) is required to determine the con rod bearing clearance.



Determining con rod bearing clearance

- The con rod bearing clearance is given by the difference of the inside diameter of the con rod bearing shells (C) and the diameter of the lifting journal (D).

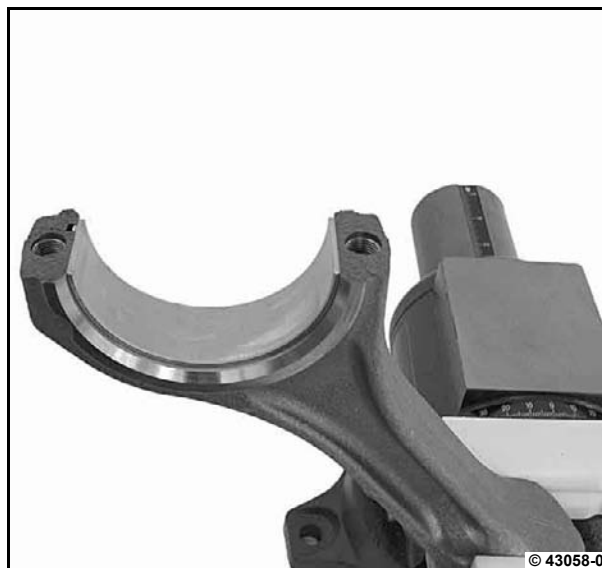


P02 56

Calculation example

Desired:	Con rod bearing clearance
Given:	
Measured:	(C) = 70.026 mm
	(D) = 69.994 mm
	Dimension (A) - Dimension (B)
Result:	= 0.032 mm

- Unscrew screws and remove con rod bearing cover.



6

Checking the con rod



Check con rod without bearing shells on the con rod test device.



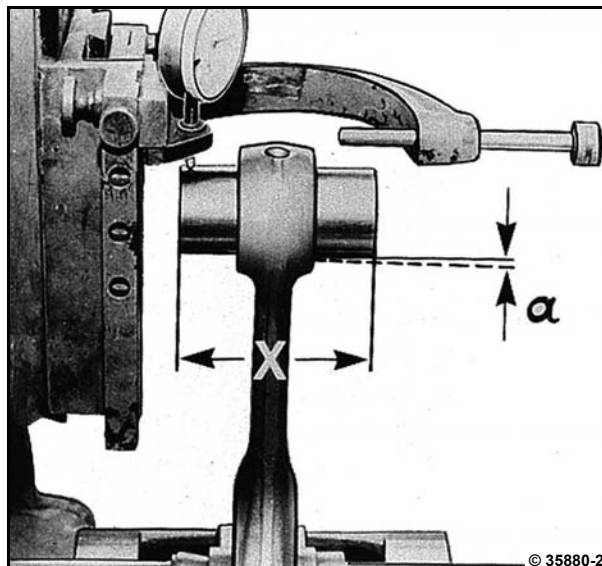
Attention!

Aligning the con rod is not permissible.

- Check that the con rod is parallel.



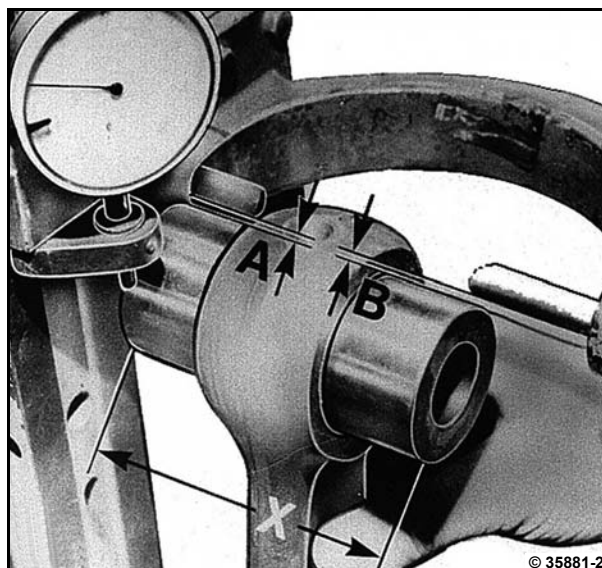
Permissible deviation (a) = **max. 0.04 mm**
at a distance of (X) = **100 mm**.



- Check the angle of the con rod.



Permissible deviation
(A) to (B) = **max. 0.04 mm** at a distance of
(X) = **100 mm**.



Removing and installing the crankshaft



Commercial available tools

Special tools:

– Turning gear100 330



– W 02-01-07

– W 03-08-01

– W 04-04-09



Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the con rod bearing cover!

6

Removing crankshaft

- Remove gearcase (flywheel side).

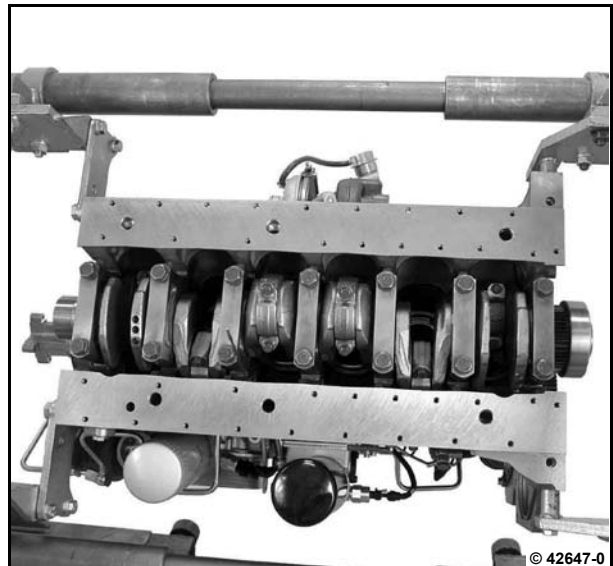


W 04-04-09

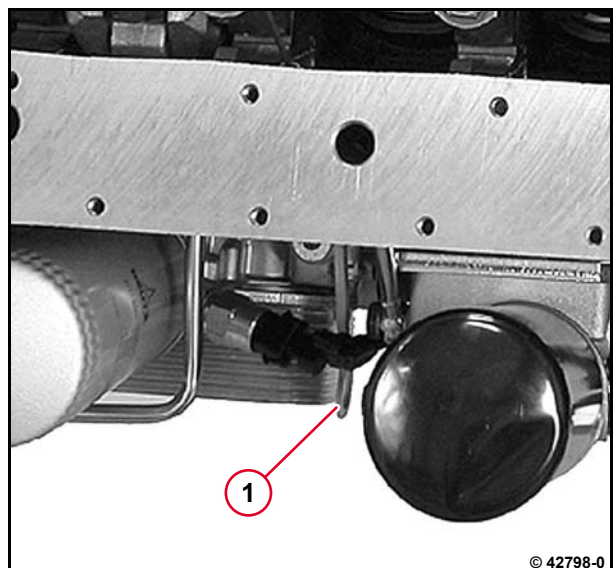
- Remove front cover (opposite side to flywheel).



W 03-08-01

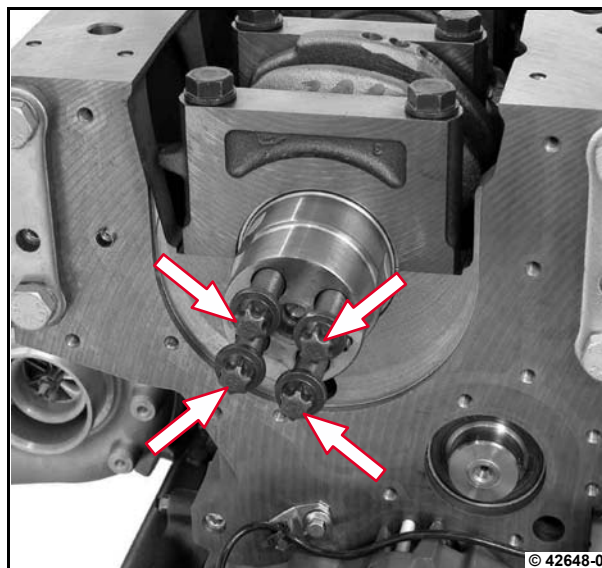


- Pull out oil dipstick (1).



Removing all con rod bearing covers

- Tighten screws (arrows) of the torsional vibration damper.



- Place lifting journal of the respective cylinder at bottom dead centre (BDC).

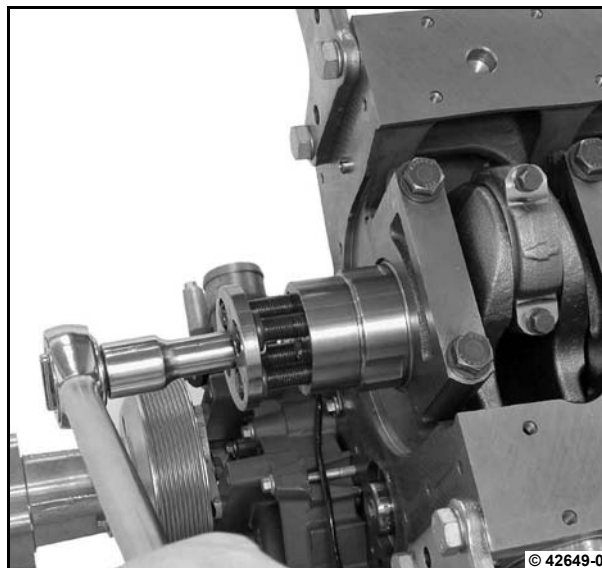


Attention!

Do not jam the con rods when turning the crankshaft.



Use the turning gear 100 330 to turn the crankshaft.



- Unscrew screws (1), remove con rod bearing cover (2) with con rod and bearing shell.

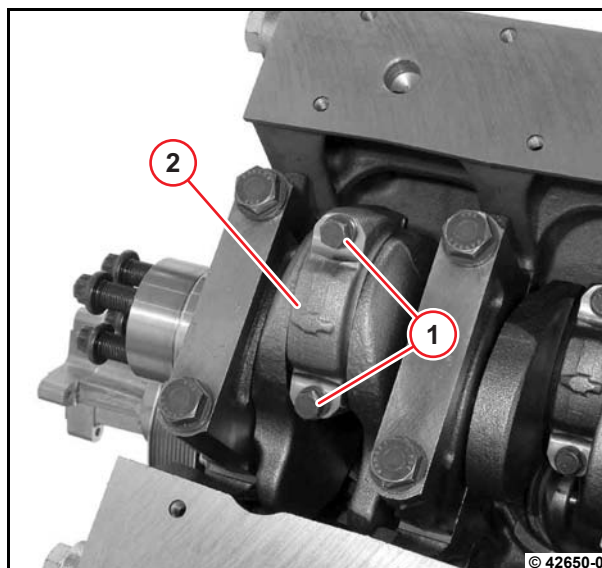


Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!



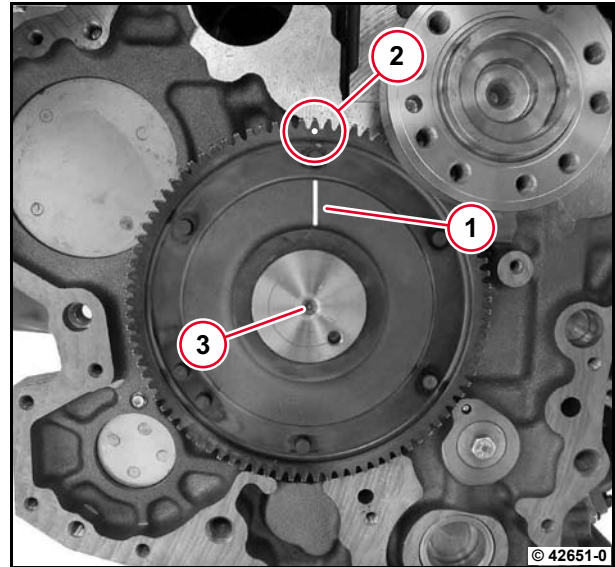
Put down the components in order of assembly, note order of cylinders.



- Make a mark (1) on the camshaft gear wheel for assistance.



Your mark must be on a line between the marking (2) and the middle (3) of the camshaft.



6

- Turn the crankshaft evenly until the marking (1) on the crankshaft flange is in line with your mark (2) on the camshaft gear wheel.

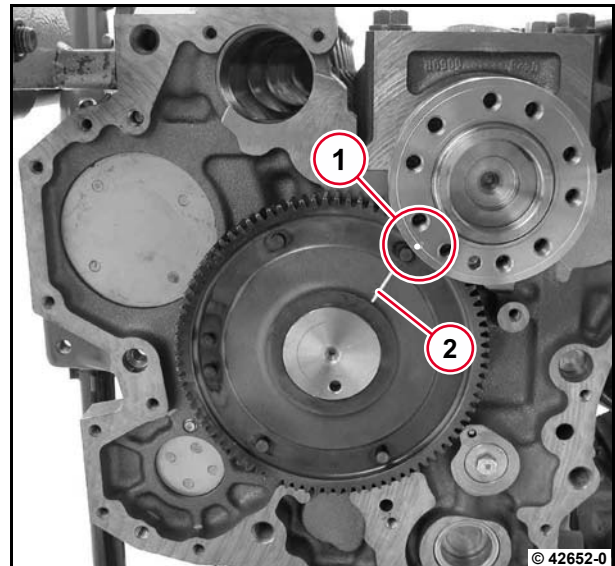


The marking on the camshaft gear wheel is covered by the crankshaft flange when it is in line.



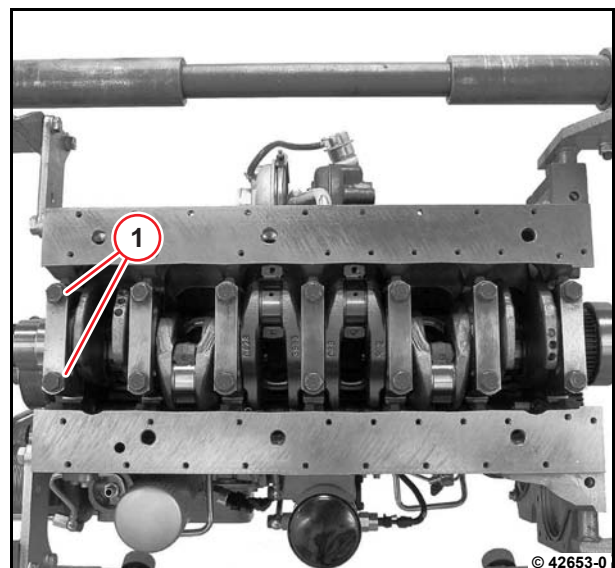
Attention!

Do not jam the con rods when turning the crankshaft.



Remove all main bearing covers

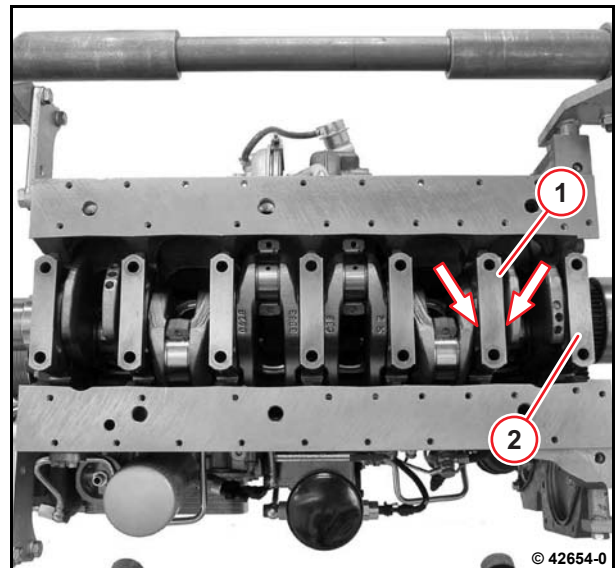
- Unscrew all screws (1).



- Remove the bearing cap (1), bearing shell and both wearing ring halves (arrows).
- Remove all main bearing covers (2) and bearing shells.



Put down the components in the order of assembly, note order of cylinders.



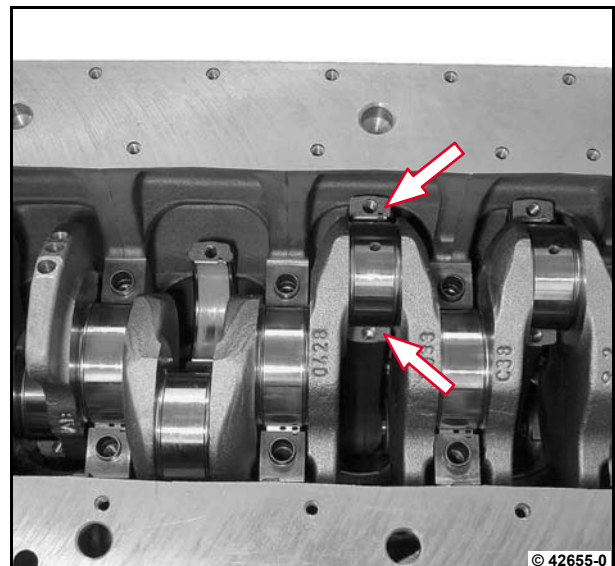
- Press the con rods carefully out of the lifting journal.



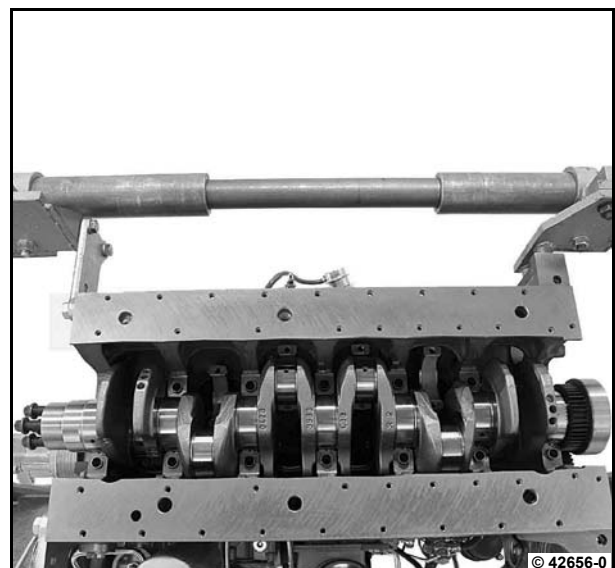
Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas (arrows) of the con rod and the con rod bearing cover!



- Remove crankshaft.



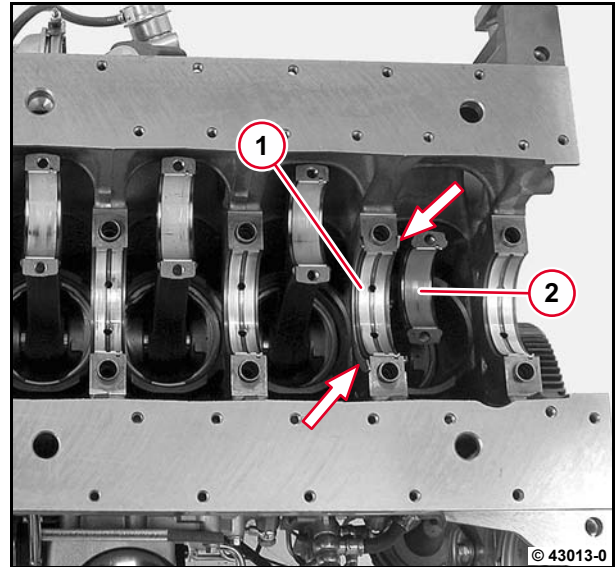
- Remove both wearing ring halves (arrows), all main bearings (1) and all con rod bearing shells (2).



Put down the components in the order of assembly, note order of cylinders.

- Check components for visible signs of wear.
- Check axial bearing clearance of crankshaft.

 W 02-01-07



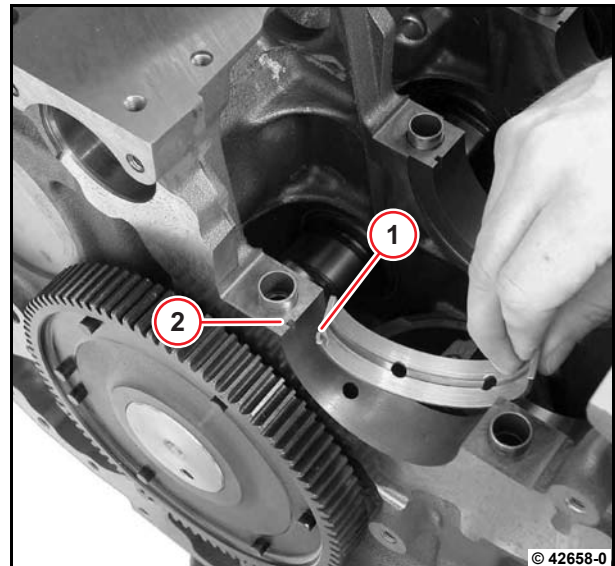
6

Installing crankshaft

- Insert the main bearing shells in the crankcase.



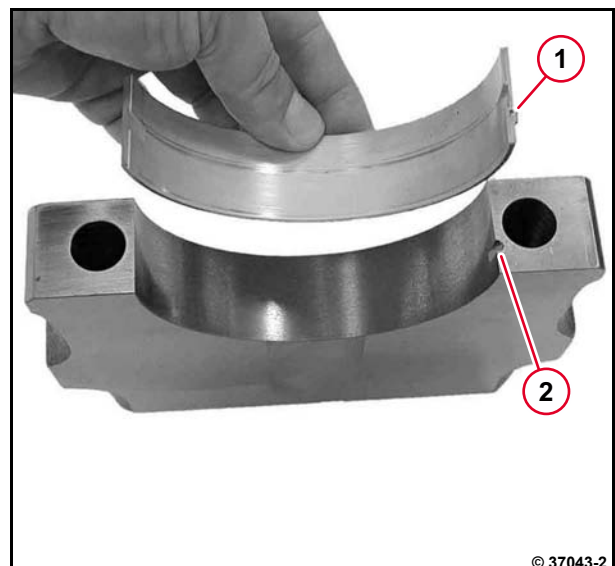
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Insert main bearing shell in the respective main bearing cover.



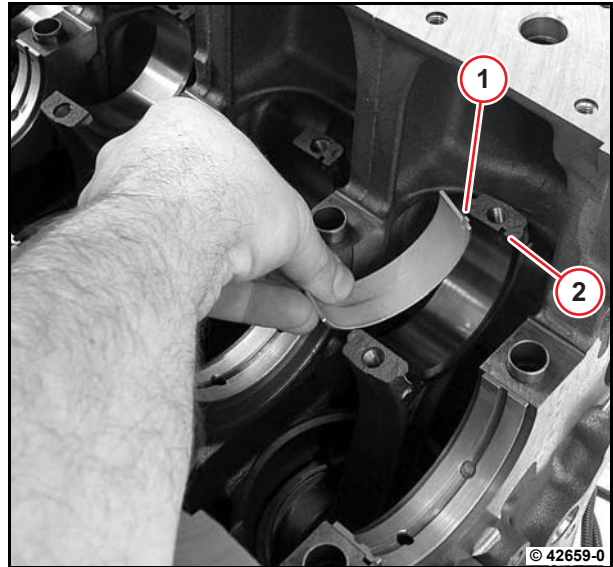
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Insert con rod bearing shell in the con rod.



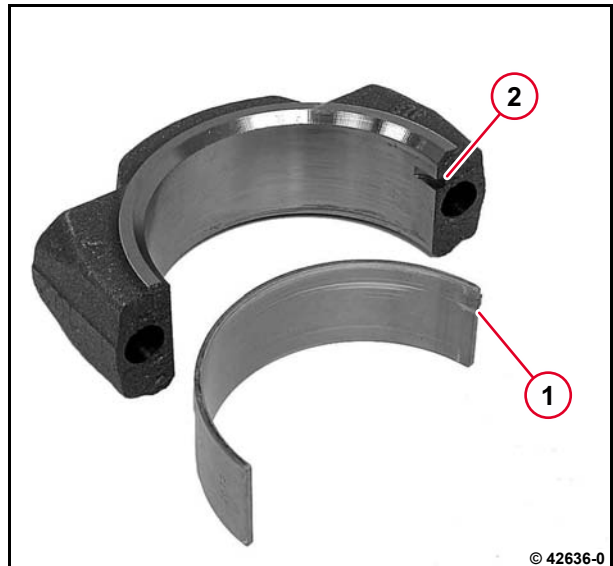
Note the assignment of the bearing shells.
The anti-rotation lock (1) must lock in groove (2).



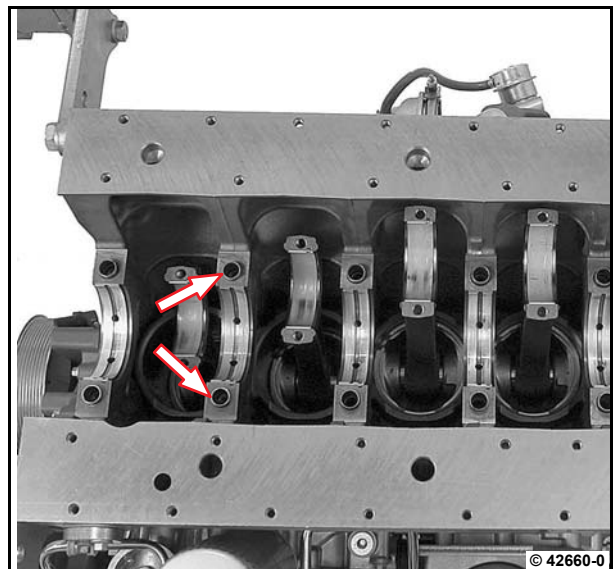
- Insert con rod bearing shell in the respective con rod bearing cover.



Note the assignment of the bearing shell.
The anti-rotation lock (1) must lock in groove (2).



Make sure the clamping bushes (arrows) are in place.

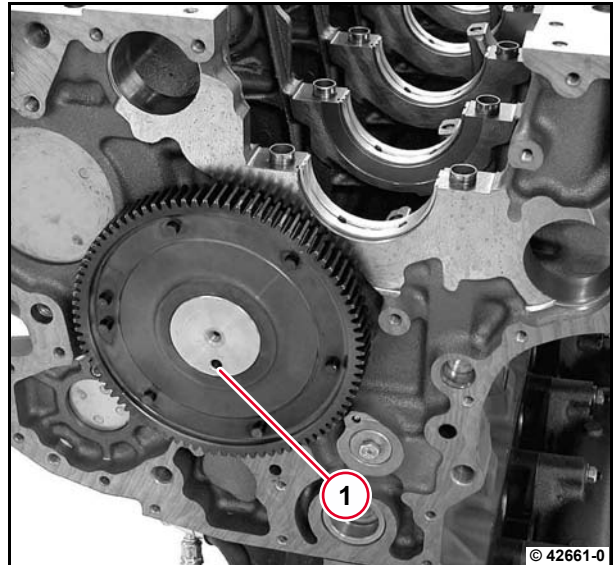


- Position camshaft.



The bore (1) must be facing the cylinder head.

- Lightly oil all bearing surfaces on the bearing pin and bearing shells.



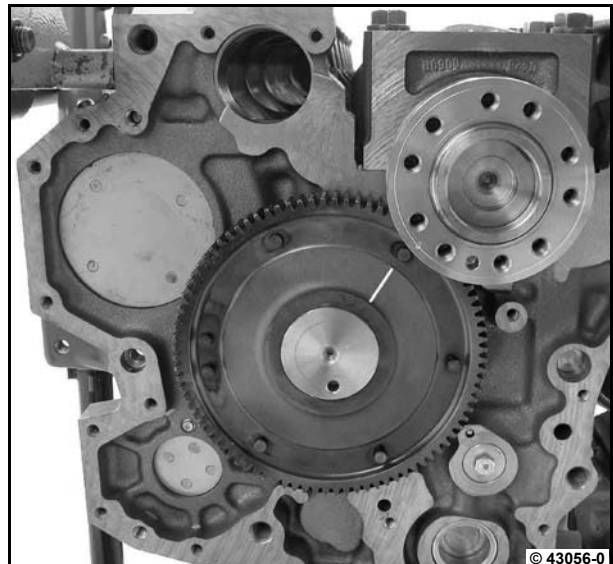
6

- Insert the crankshaft carefully in the crankcase.



Attention!

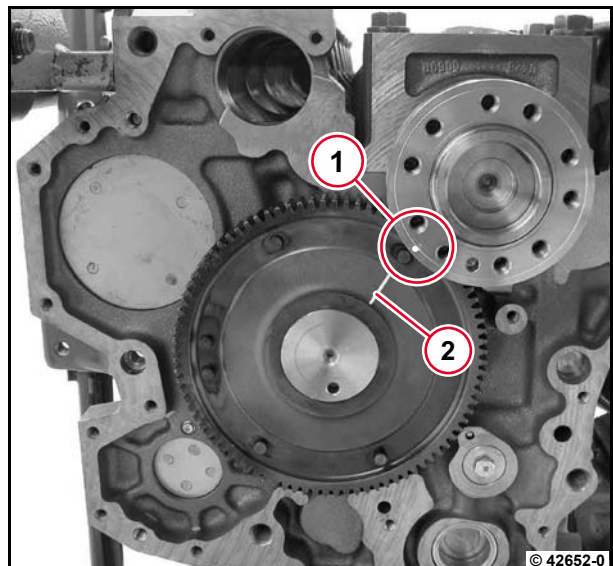
The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!



- Set the crankshaft in line with the camshaft.



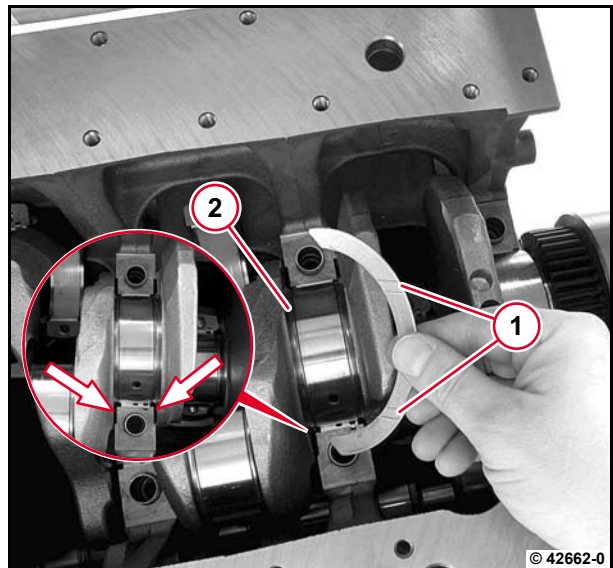
The marking (1) on the crankshaft flange must be in line with your mark (2).



- Insert both wearing ring halves, without guide lugs, between the crankshaft and the crankcase (arrows).



The oil grooves (1) must face the crankshaft web face (2).

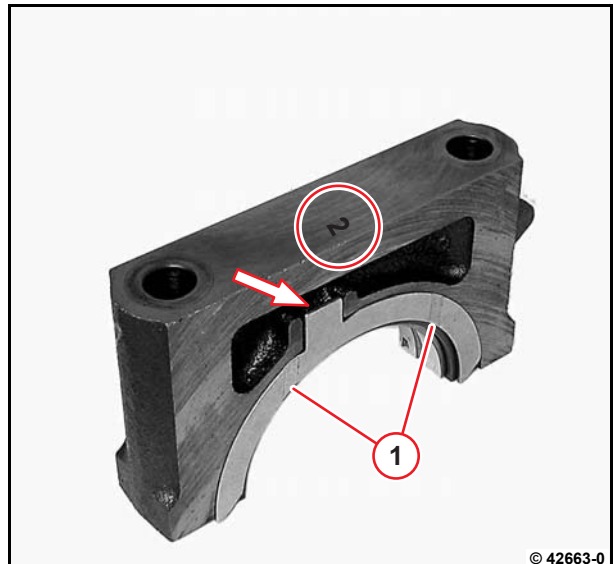


- Fix both wearing ring halves with guide lug (arrow) to the bearing cap with a little grease.



The bearing cap has the **identification number 2**.

The oil grooves (1) must face the crankshaft web face.



Install all main bearing covers

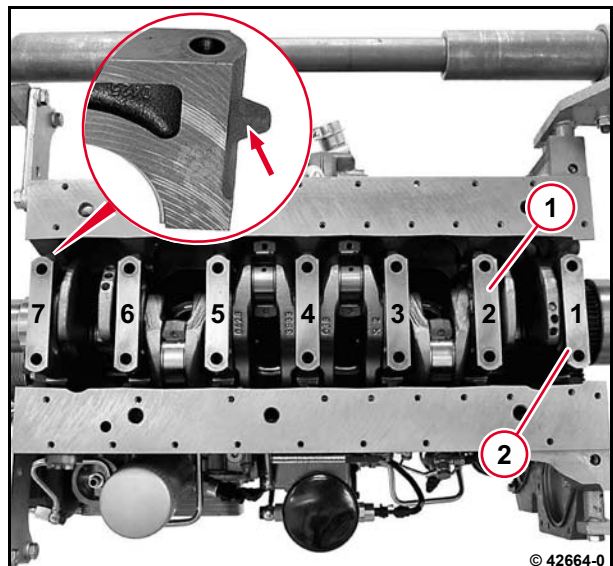
- Insert bearing caps (1) and main bearing covers (2) according to their numbering.



Note the assignment and installation position:

Insert main bearing cover with **number 1** on the flywheel side.

The gate (arrow) on the bearing covers must face the manifold side.



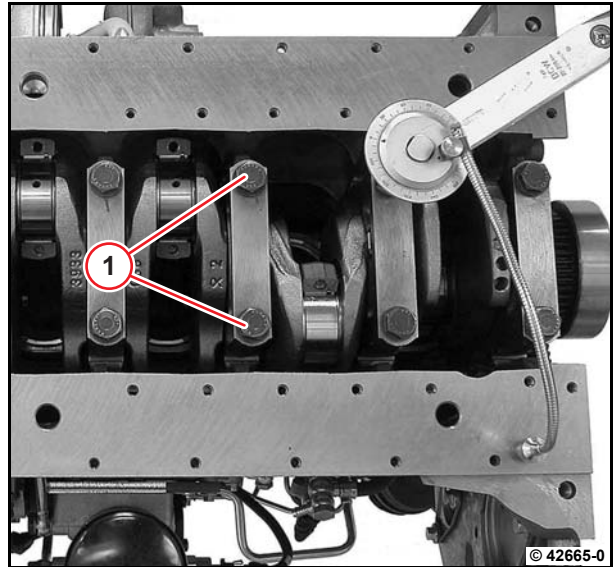
- Tighten all screws (1) of the main and bearing caps.

 A02 010



Attention!

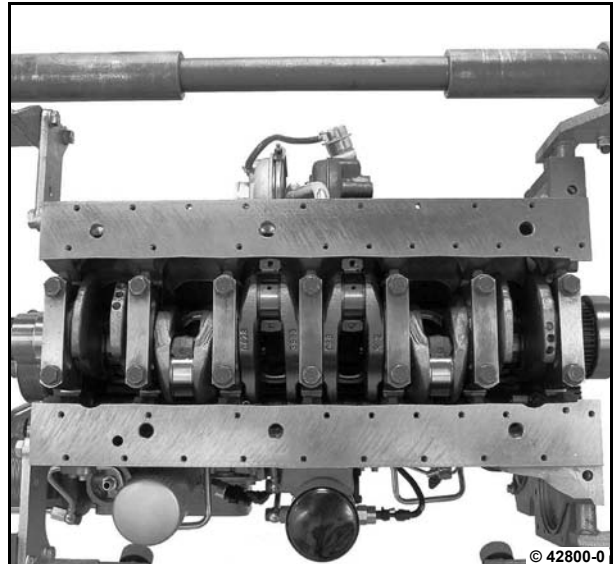
Screws can be used a **max. 3 times** with written proof, otherwise renew every time they are loosened.



6

Install all con rod bearing covers

- Pull con rods carefully on to the lifting journal.
- Place lifting journal of the respective cylinder at bottom dead centre (BDC).



- Mount con rod bearing cover.

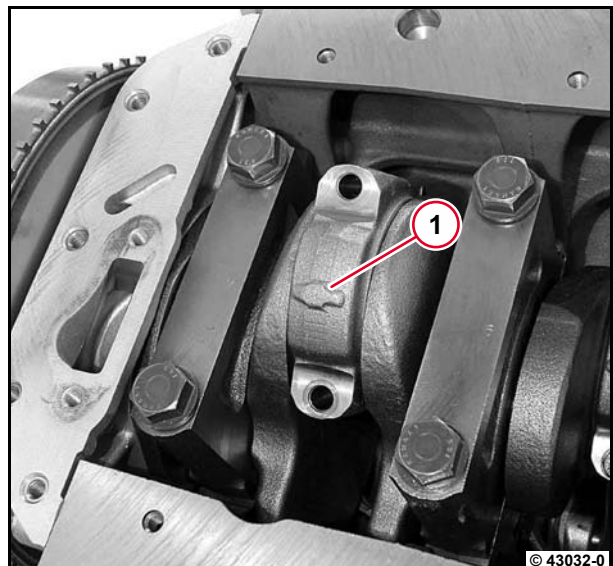


Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!
Do not jam the con rods when turning the crankshaft.



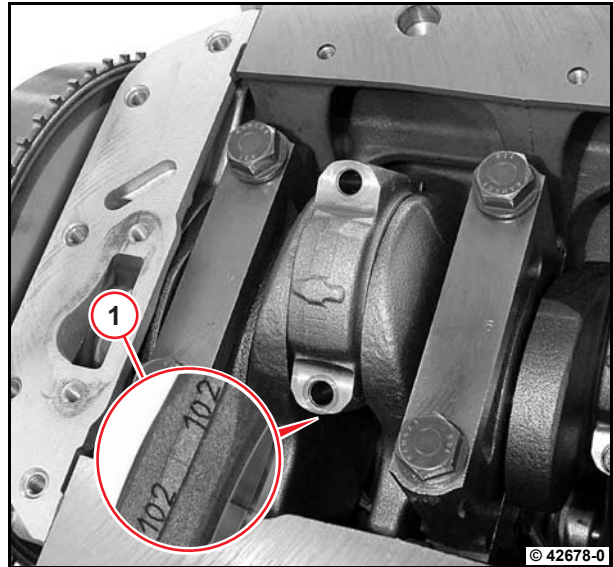
The arrow (1) on the con rod bearing cover must face the front cover.





Note the assignment of the con rod bearing cover.

The identification numbers (1) on the con rod and the con rod bearing cover must be identical and opposite to each other when assembled.



- Tighten new screws.

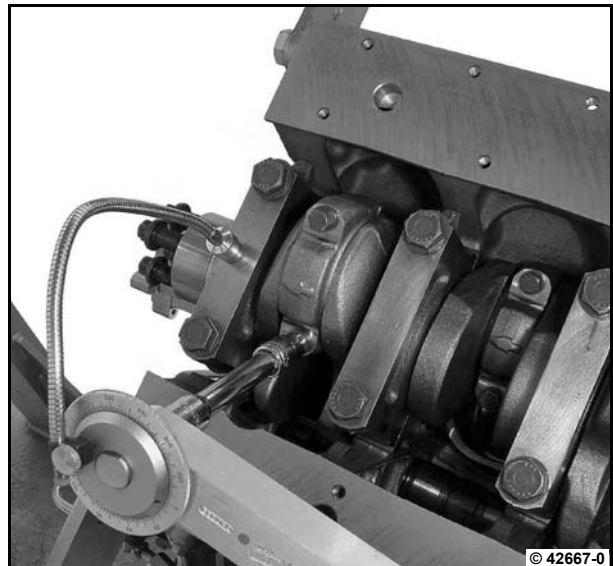


A02 020

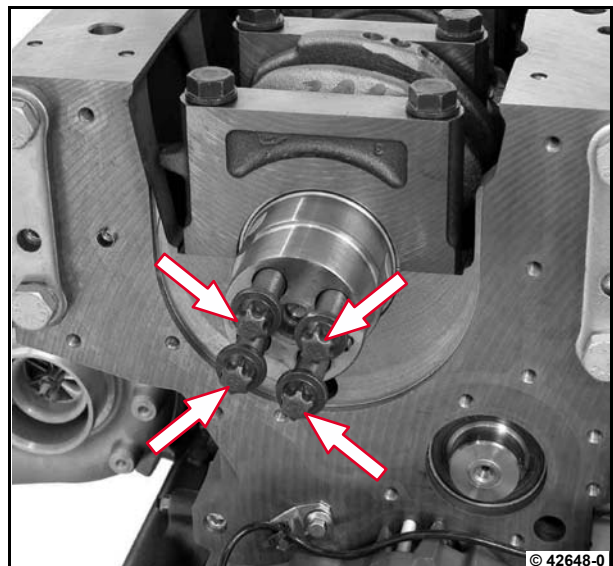


Attention!

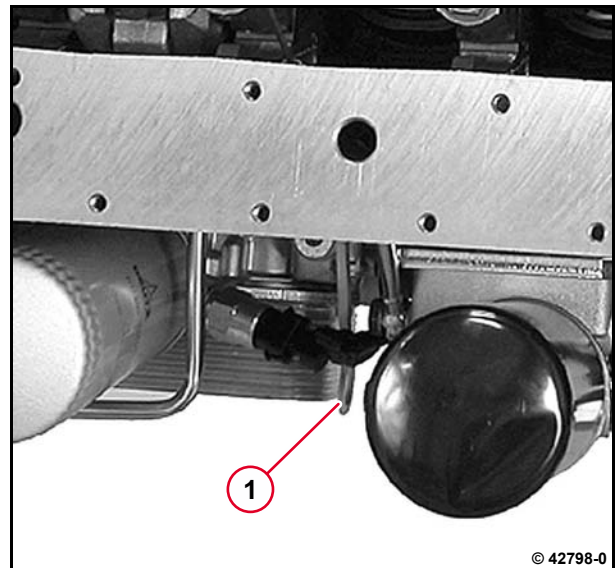
Renew screws every time they are loosened.



- Unscrew screws (arrows) of the torsional vibration damper.



- Insert oil dipstick (1).

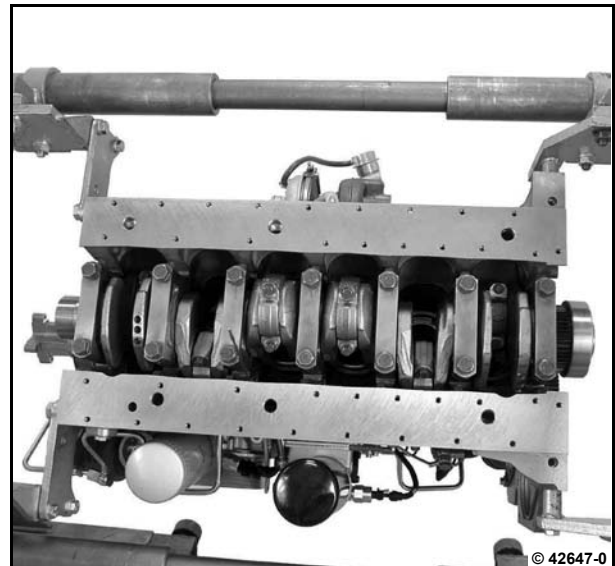


- Mount front cover (opposite side to flywheel).

 [W 03-08-01](#)

- Install gearcase (flywheel side).

 [W 04-04-09](#)



Removing and installing piston and con rod



Commercial available tools:

– Rotation angle disc 8190

Special tools:

– Piston ring compressor 130 670



– W 01-04-04

– W 02-10-03

– W 08-04-06



Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the con rod bearing cover!



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The engine oil and coolant should be added according to the operating manual.

6

Removing the piston and con rod

- Remove cylinder head.

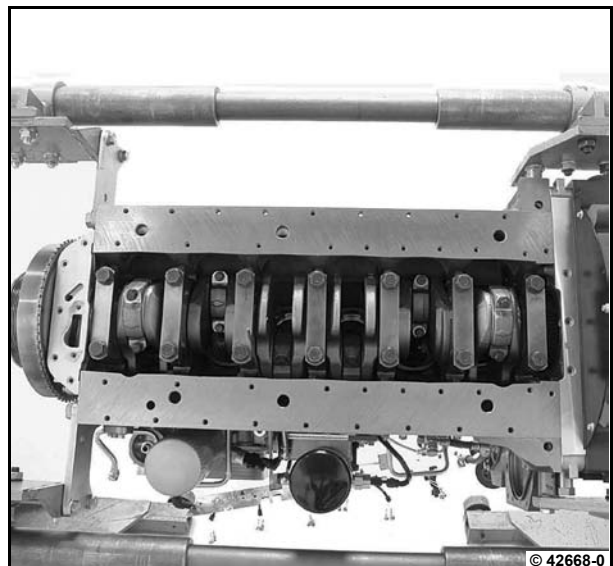


W 01-04-04

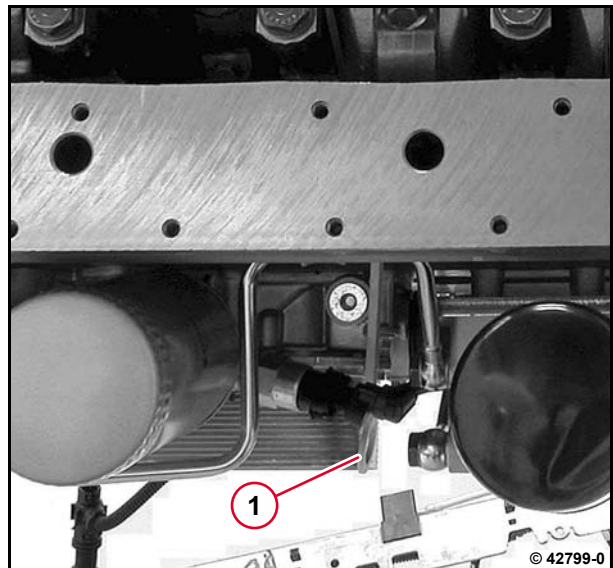
- Remove oil suction pipe.



W 08-04-06



- Pull out oil dipstick (1).



Remove con rod bearing cover

- Set lifting journal at bottom dead centre (BDC).
- Unscrew screws (1), remove con rod bearing cover (2) with bearing shell.

 P01 63

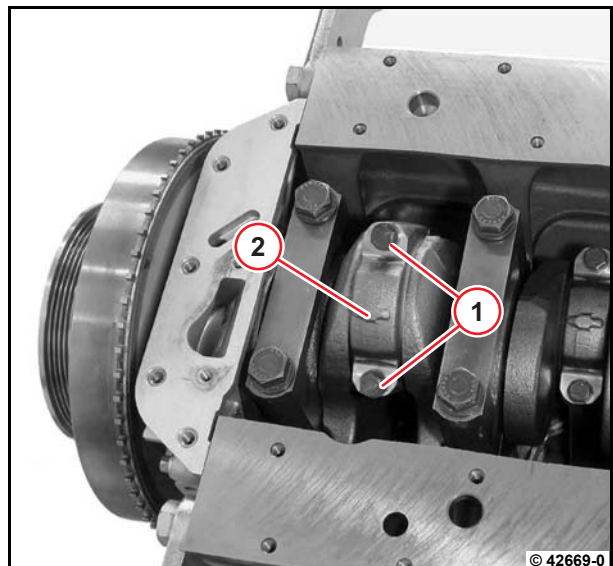


Attention!

Do not place the con rod bearing cover on the break surface.



Lay out the components in the order of assembly, note order of cylinders.



- Press out the piston with con rod.

 P01 63

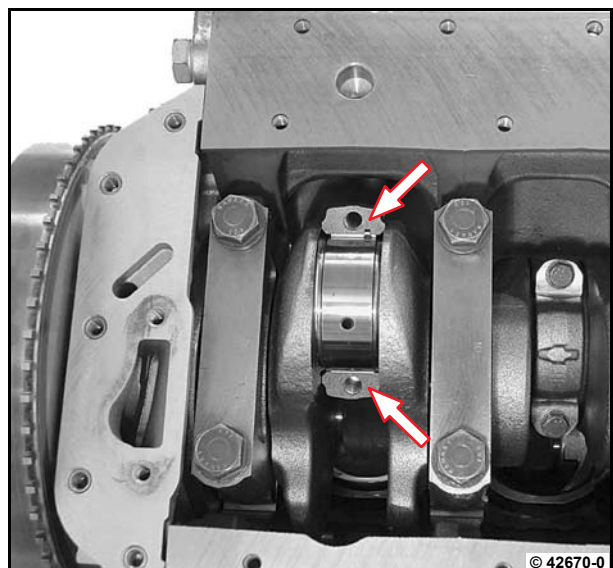


Attention!

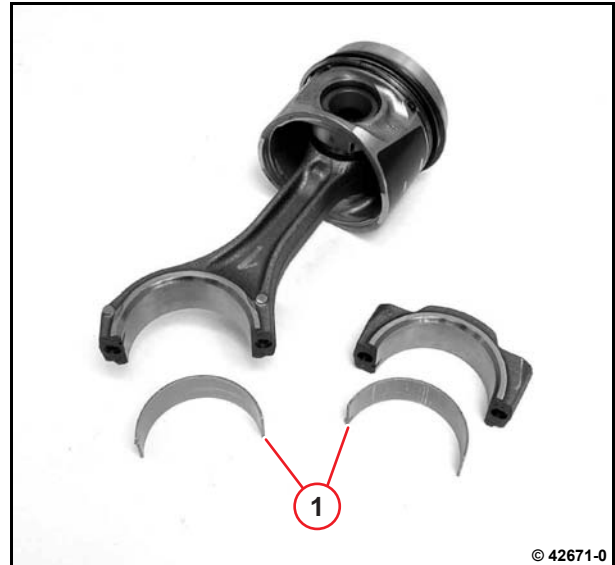
The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!
Do not damage the break areas of the con rod and the con rod bearing cover!



Lay out the components in the order of assembly, note cylinder assignment.



- Remove con rod bearing shells (1).
- Check components for visible signs of wear.



6

Disassembling piston from con rod

- Remove circlip from both sides and press out the piston bolt.
- Check components for visible signs of wear.



Completing con rod and piston

- Insert a circlip.



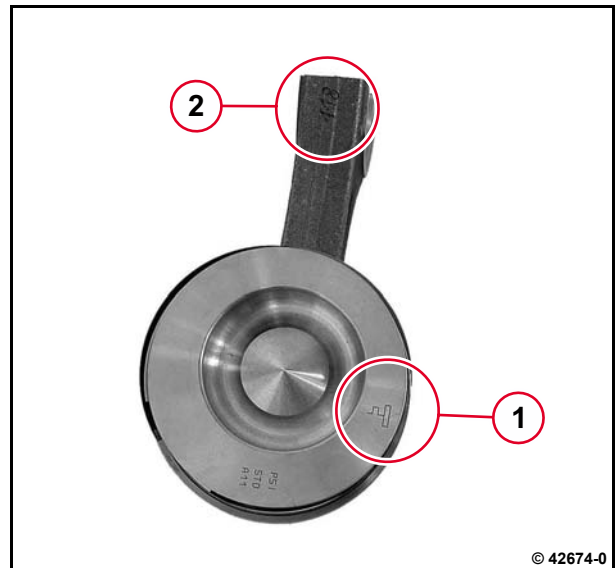
Make sure the circlip fits properly in the groove.



- Insert con rod in piston.



The symbol flywheel/crankshaft (1) on the piston base must face to the right and the identification number (2) on the con rod must face upwards.



- Oil the piston bolt lightly and press in.
- Insert second snap ring.



Make sure that the circlip fits correctly in the groove.

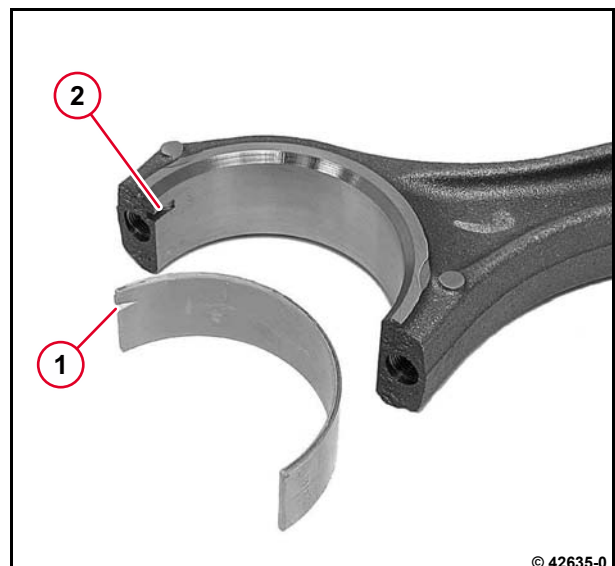


Installing the piston and con rod

- Insert con rod bearing shell in the con rod.



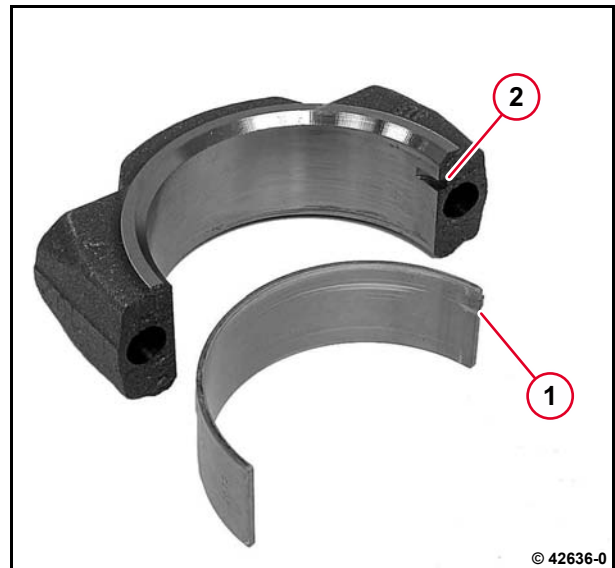
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Insert con rod bearing shell in the respective con rod bearing cover.



The anti-rotation lock (1) must lock in groove (2).



6

- Arrange the piston ring joints with an offset of **about 120°** to each other.
- Check piston rings and piston ring grooves.



[W 02-10-03](#)

-



- Lightly oil cylinder running surface, piston, piston rings and lifting journal.
- Clamp piston rings with piston ring compressor (1).



Do not turn the piston rings any further.



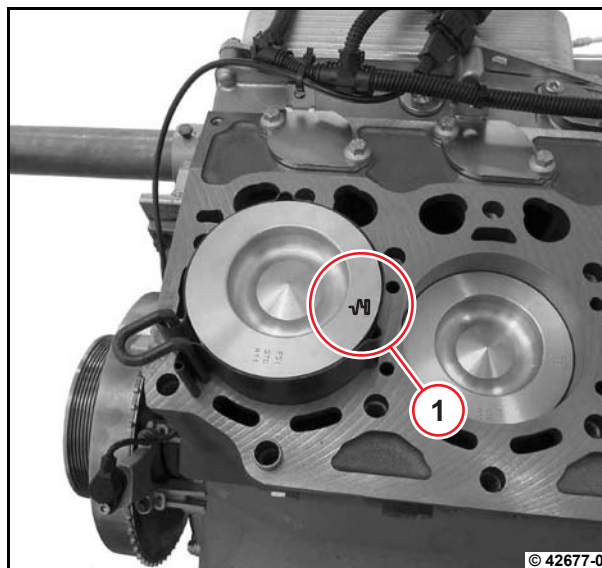
- Set lifting journal at bottom dead centre (BDC).
- Push piston with con rod into the cylinder.



Note the cylinder assignment of the piston.

Note the label indicating the installation position on the piston base. The symbol flywheel/crankshaft (1) must face the fly-wheel.

The piston ring compressor must lie flat on the crankcase.

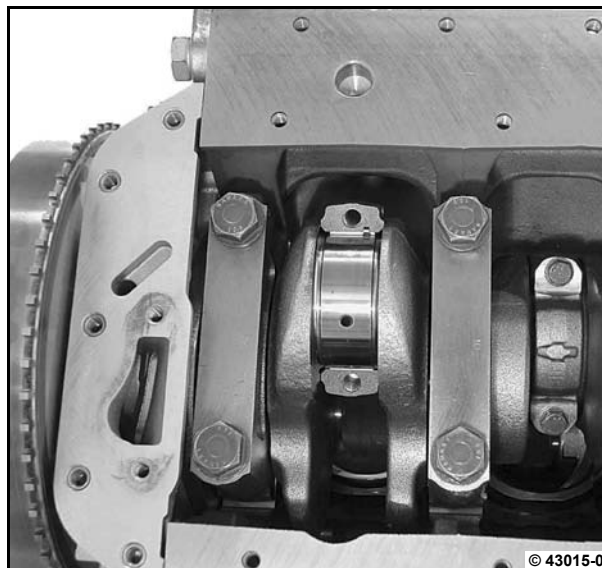


- Press the con rod carefully against the lifting journal.



Attention!

Do not jam the con rod with the crankshaft.



Installing the con rod bearing cover.

- Mount con rod bearing cover.



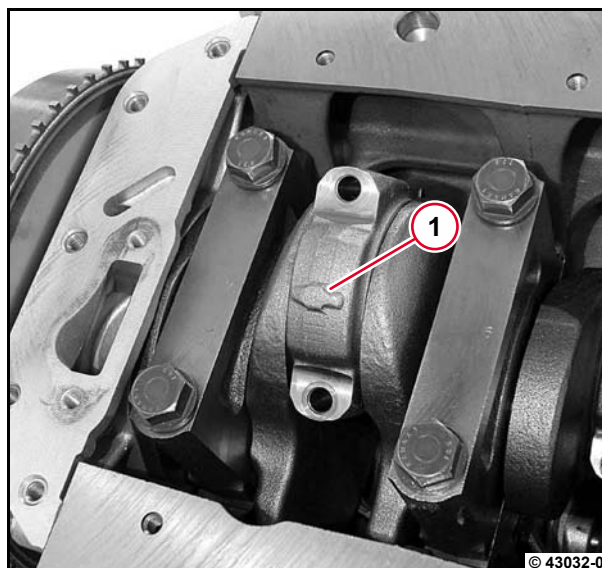
Attention!

The alignment of the con rod and con rod bearing cover must be maintained. If the con rod and the con rod bearing cover are installed the wrong way around, the con rod will be useless!

Do not damage the break areas of the con rod and the con rod bearing cover!



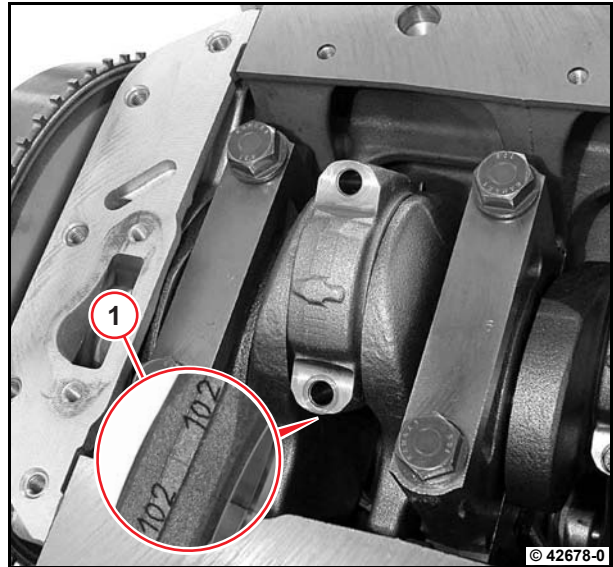
The arrow (1) on the con rod bearing cover must face the front cover.





Note the assignment of the con rod bearing cover.

The identification numbers (1) on the con rod and the con rod bearing cover must be identical and opposite to each other when assembled.



6

- Tighten new screws.

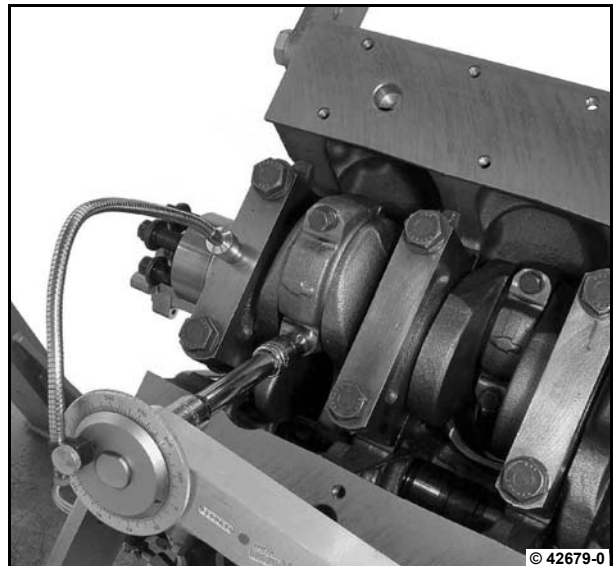


A02 020

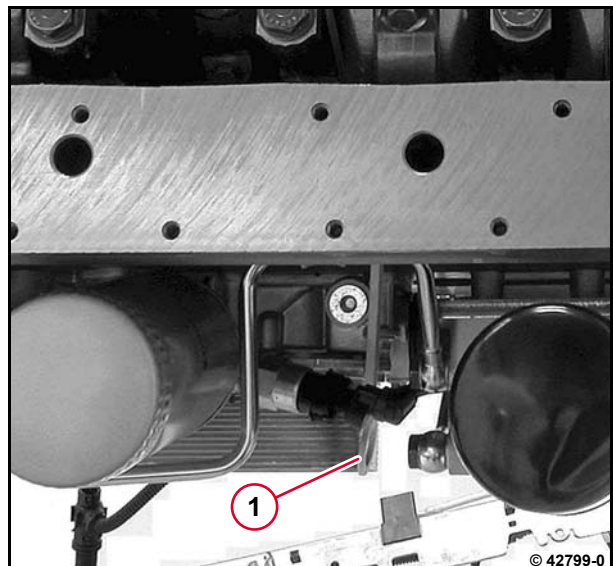


Attention!

Renew screws every time they are loosened.



- Insert oil dipstick (1).

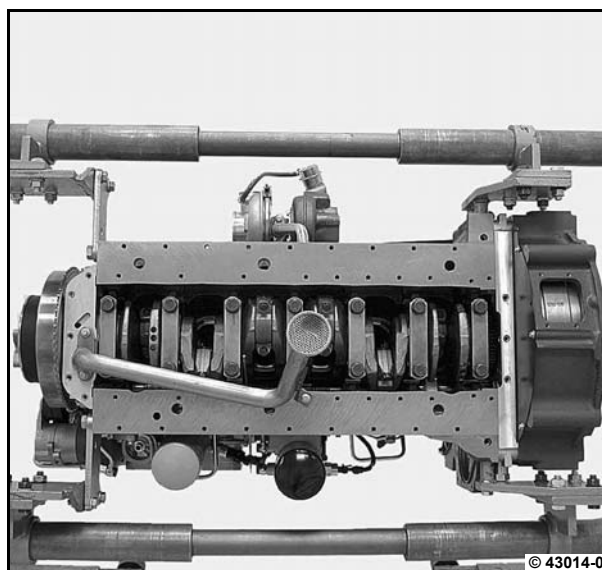


- Install oil suction pipe.

 [W 08-04-06](#)

- Install cylinder head.

 [W 01-04-04](#)



Checking the piston



Commercial available tools:

- Micrometer gauge
- Internal precision measuring device

Special tools:

- Dial gauge. 100 400



– W 02-09-03



When the wear limit is reached the pistons must be replaced.

Checking the piston bolt bore

- Disassemble piston from con rod.



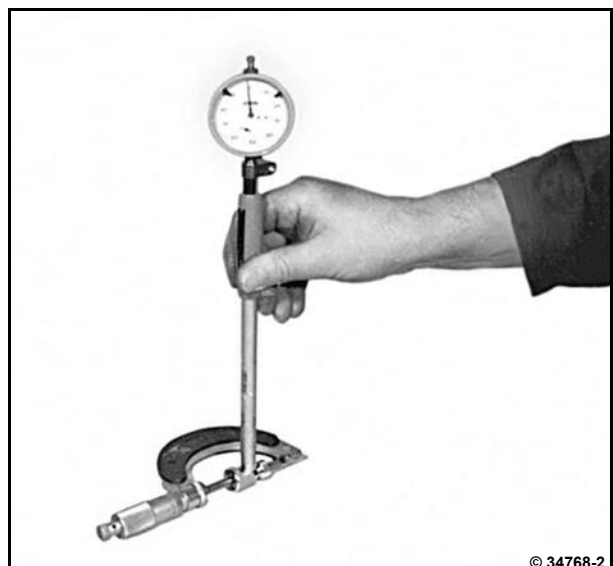
W 02-09-03



© 42229-1

- Prepare internal precision measuring device

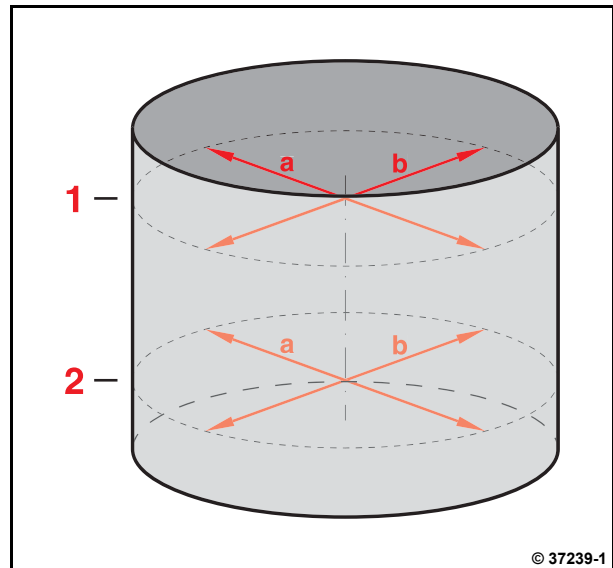
- Mount probe bolt for the appropriate measuring range in the internal precision measuring device.
- Mount dial gauge with **approx. 1 mm** pre-tension in the internal precision measuring device.
- Set micrometer gauge to **39 mm**.
- Balance the internal precision measuring device between the test surfaces of the micrometer gauge and set the dial gauge at the reversal point of the pointer to **zero**.



© 34768-2



Diagram for measuring the piston bolt bore at the points (a and b) in the levels (1 and 2).



- Measure piston bolt bore with internal precision measuring device. Insert internal precision measuring device in the piston bolt bore.
- Balance the internal precision measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



P02 78



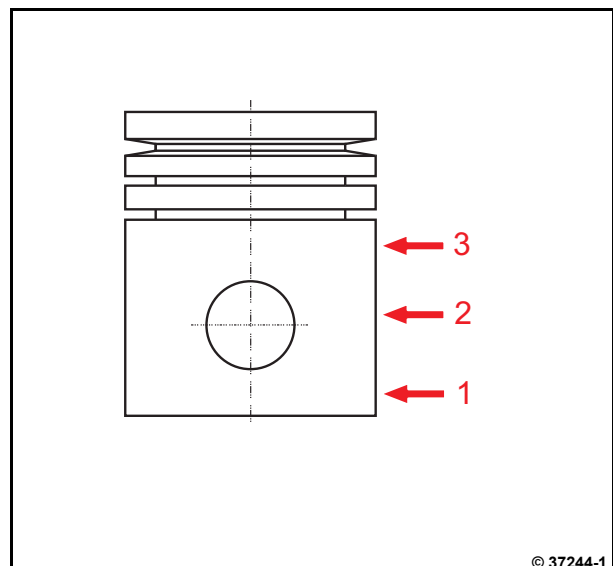
Measuring points, see diagram.



Checking the piston diameter



Diagram for measuring the piston diameter at the measuring points (1, 2 und 3), transverse to the piston bolt bore.



- Measure piston diameter with micrometer gauge.

[P02 71](#)[P02 72](#)[P02 73](#)

Measuring points, see diagram.

- Complete con rod with piston.

[W 02-09-03](#)

Checking piston rings and piston ring grooves



Commercial available tools:

- Feeler gauges

Special tools:

- Universal piston ring pliers130 300
- Trapezoidal groove wear gauge130 440



– W 02-09-03

Checking the piston rings and piston ring grooves

- Disassemble piston from con rod.



W 02-09-03

- Set universal piston ring pliers to the piston diameter.



P02 73

- Remove piston rings with universal piston ring pliers.



© 42323-1

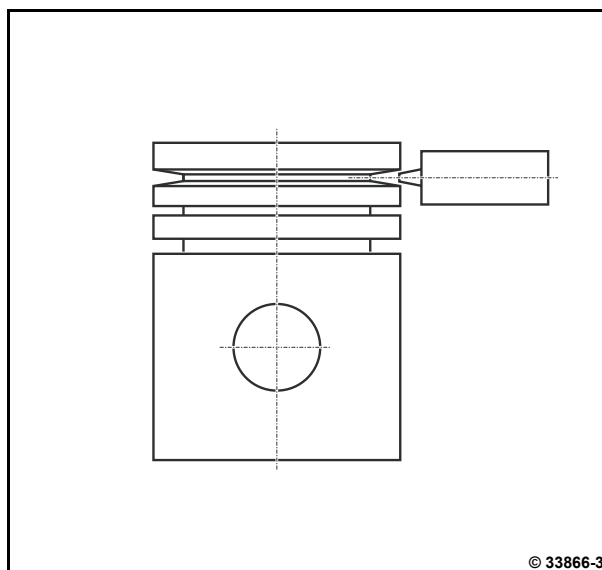
- Clean and visually inspect the pistons and ring grooves.



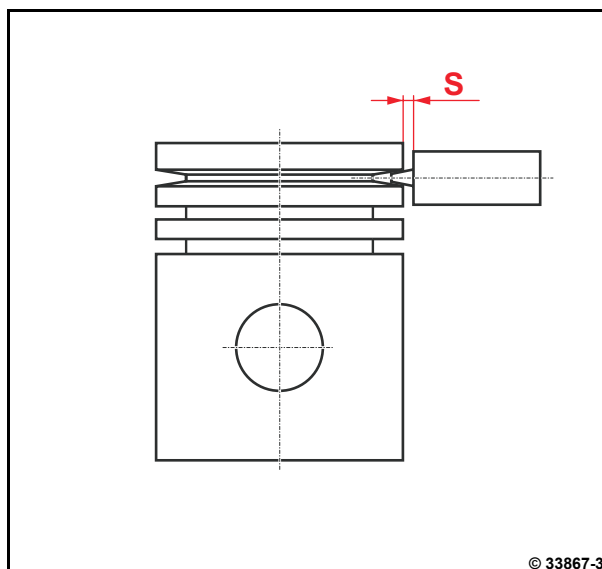
© 42322-1

- Measure piston ring trapezoidal groove for first piston ring with trapezoidal groove wear gauge.

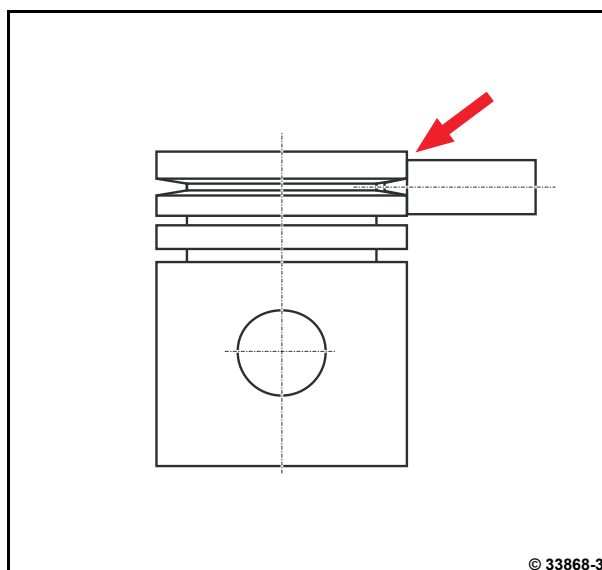
6



If there is a gap "S" between the trapezoidal groove wear gauge and piston, the piston can be used again.



If the trapezoidal groove wear gauge is touching the piston (arrow), the piston must be changed.

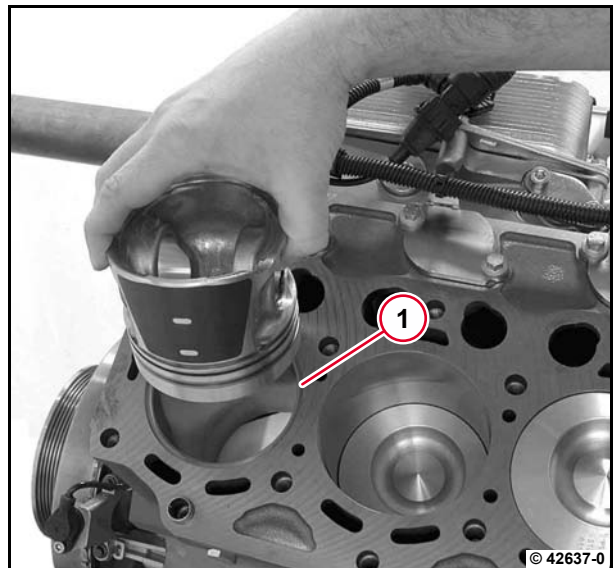


Checking the piston ring joint clearance

- Insert the piston ring (1) in the cylinder.



Align the piston ring in the cylinder by pushing the piston.



6

- Measure the piston ring joint clearance with a feeler gauge.



P02 84

P02 85

P02 86



When the wear limit is reached the piston ring must be replaced.



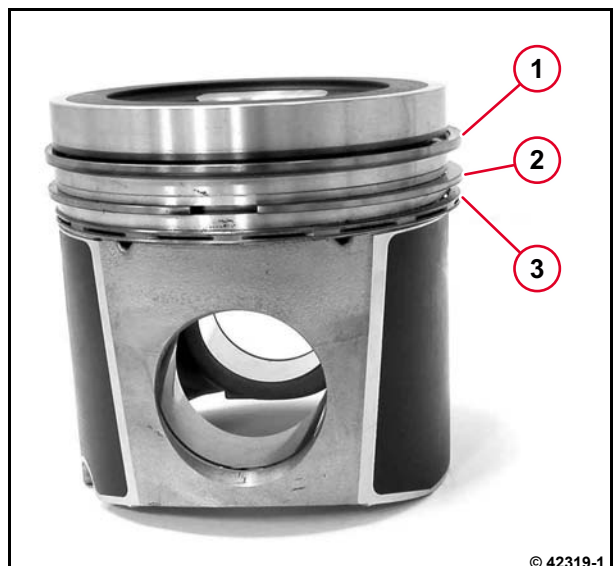
- Install piston rings.



Order and position of the piston rings as seen from the piston base.

- Double-sided keystone ring (1)
- Taper-faced ring (2)
- Bevelland-edge oil control ring with coiled spring expander (3)

For piston rings (1 and 2), the label **Top** must face the combustion chamber.



- Install piston rings with universal piston ring pliers.



Set spring joint of the bevelland-edge oil control ring **at 180°** to the ring joint.



6

Checking the piston ring axial clearance

- Measure the piston ring axial clearance in the second and third piston ring groove with a feeler gauge.



P02 87

P02 88

P02 89



Carry out measurement with new piston rings.

When the wear limit is reached the pistons must be replaced.

- Complete con rod with piston.



W 02-09-03



Removing and installing the piston cooling nozzles



Commercial available tools



– W 02-04-01

6

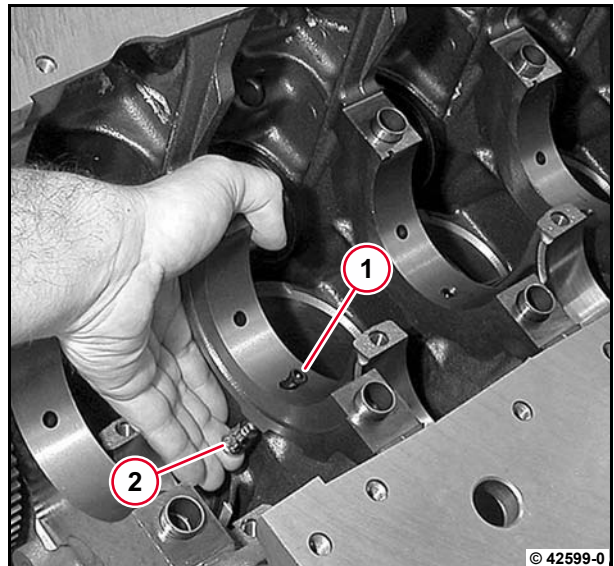
Removing piston cooling nozzles

- Dismantle crankshaft.



W 02-04-01

- Press out piston cooling nozzle (1) with a suitable tool (2).
- Visually inspect the components.

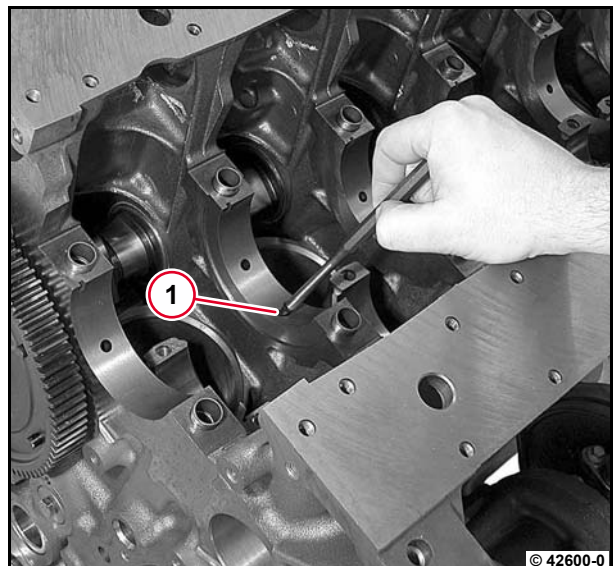


Installing the piston cooling nozzles

- Clean the bores for the piston cooling nozzles in the crankcase.
- Press in new piston cooling nozzle (1) with a suitable tool (mandrel) to the stop.
- Install crankshaft.



W 02-04-01



Removing and installing the crankcase bleeding

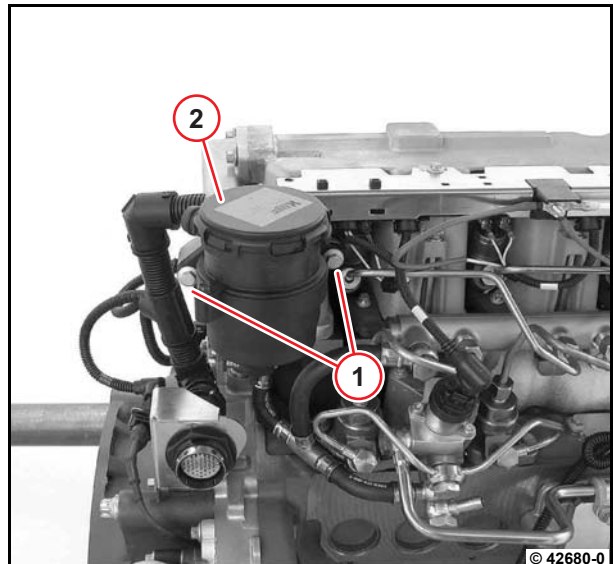


Commercial available tools

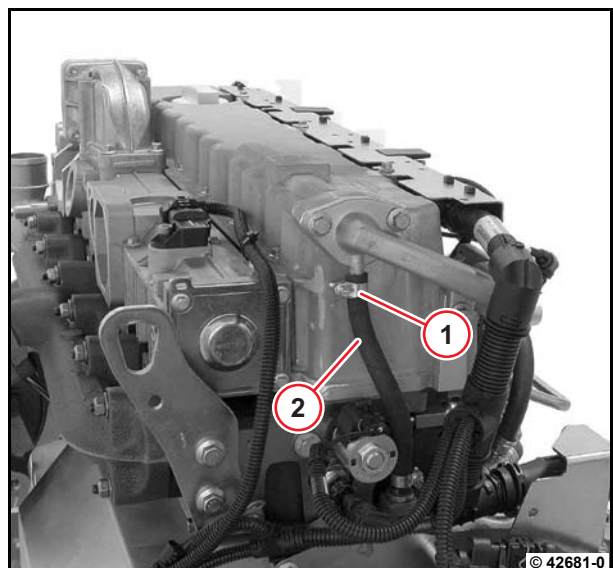
6

Removing the crankcase bleeding

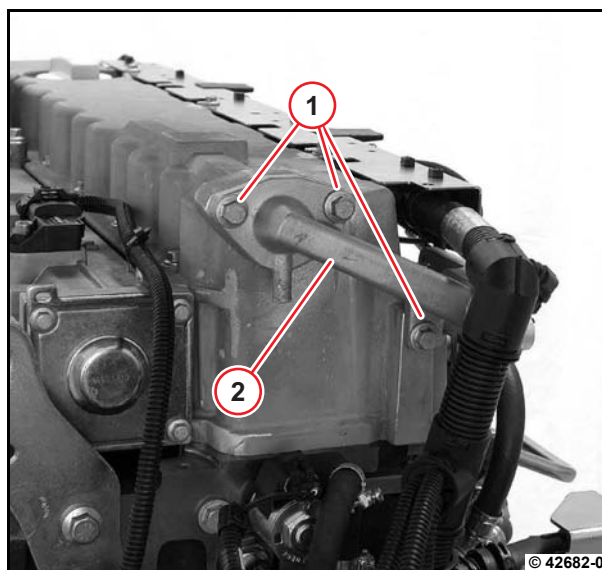
- Unscrew screws (1) and remove crankcase bleeding (2).



- Loosen hose clip (1), pull off oil return line (2) from the bleeding channel.

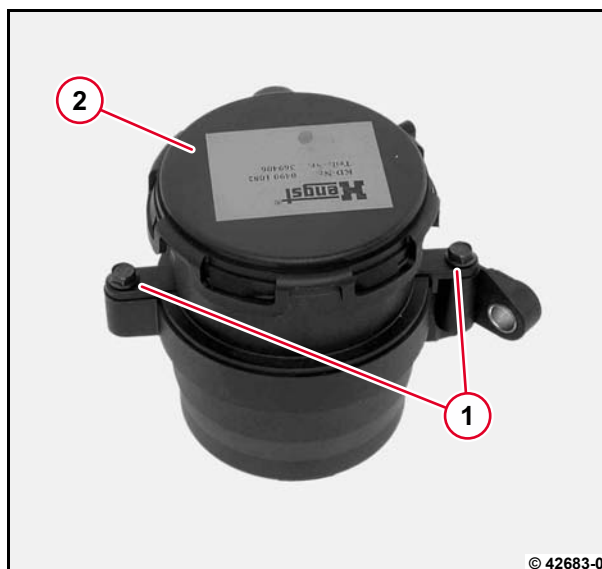


- Unscrew screws (1), remove bleeding channel (2) and gasket.



Disassembling the crankcase bleeding

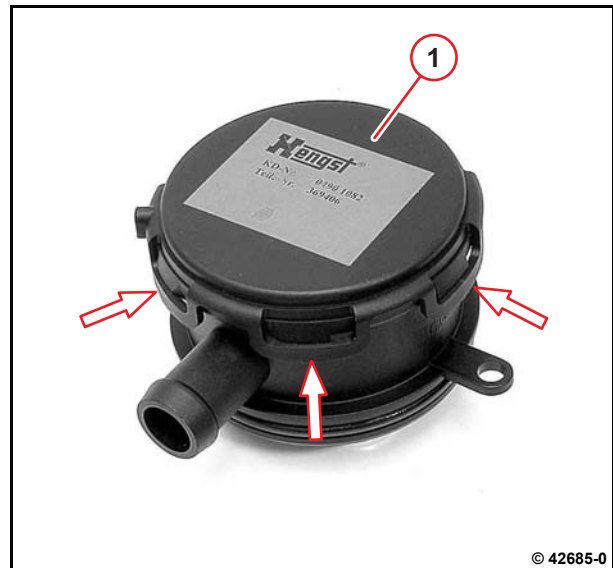
- Unscrew screws (1) and remove top part of housing (2).



- Remove insert (1).



- Uncip all retainer clips (arrow) and remove cover (1).



6

- Remove diaphragms (1) and springs.
- Clean components and check for visible signs of wear.



Assembling the crankcase bleeding

- Insert diaphragms and springs.



Note installation position of the diaphragms.



- Clip on the cover.



The outer edge of the diaphragm must grip into the groove in the housing all the way round when pressing on the cover.

Pay attention to correct fit of the retainer clips.



- Pull new round sealing ring (arrow) onto the top part of the housing.
- Oil round sealing ring lightly



- Pull new round sealing ring (arrow) onto insert.
- Oil round sealing ring lightly

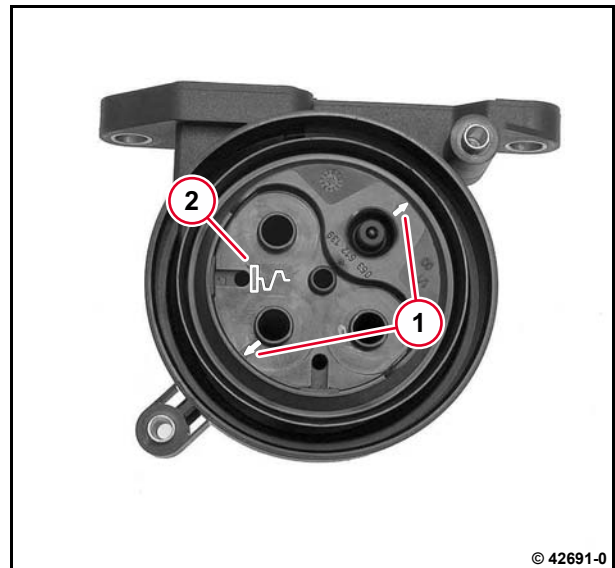


- Push insert into bottom part of housing.



The arrows (1) must face the threaded sleeves.

The symbol flywheel/crankshaft (2) must face the flywheel when mounting the crankcase bleeding.



- Insert the top part of the housing and tighten the screws.

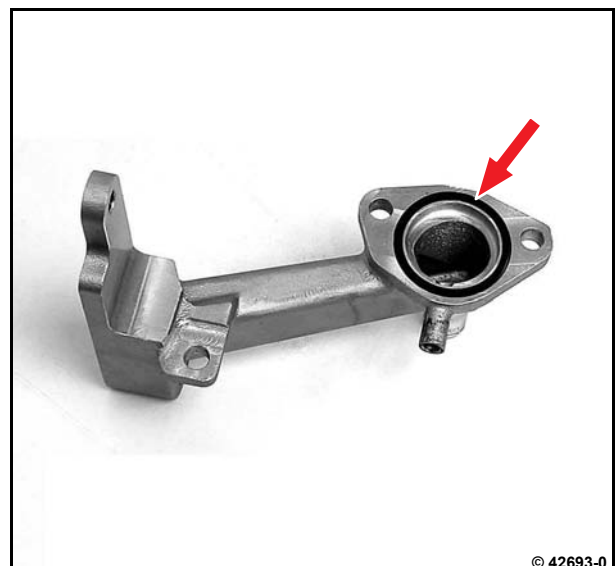


The hose connection (1) must face the fastening flange.



Installing the crankcase bleeding

- Clean the sealing surface on the bleeding channel and cylinder head cover.
- Insert new gasket (arrow).



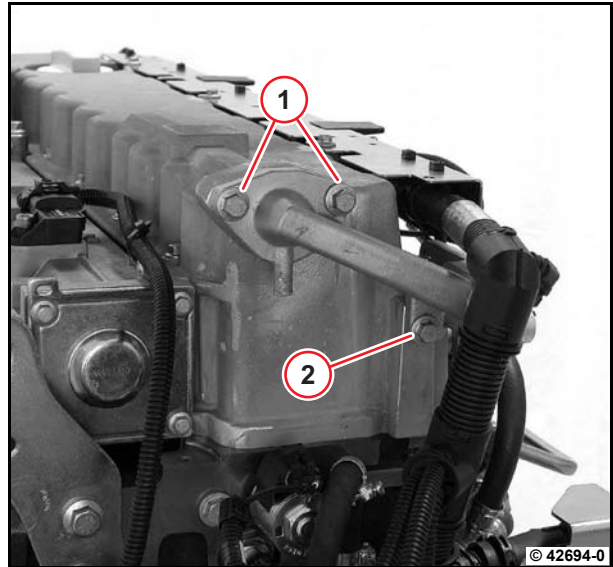
- Mount bleeding channel and tighten screws.



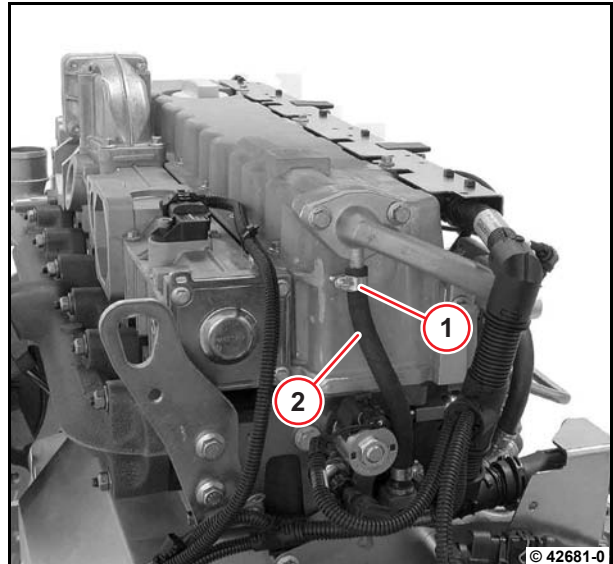
Note the different screw lengths:

Screw M8 x 25 mm (1)

Screw M8 x 20 mm (2)



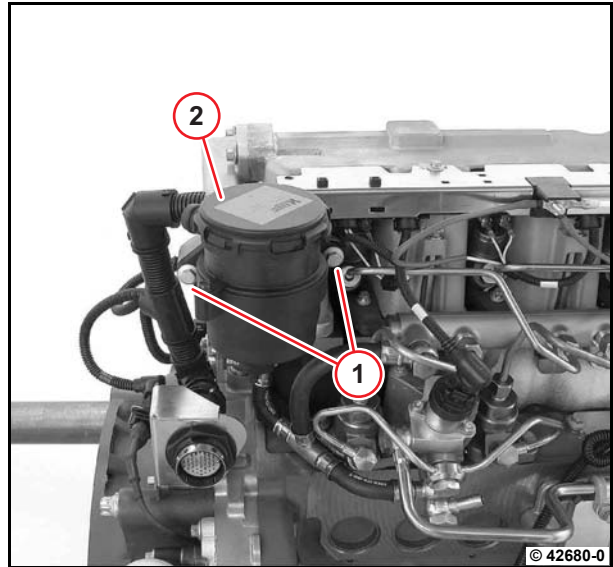
- Plug the oil return line (2) to the bleeding channel and fix the hose clip (1).



- Clean the sealing surface on the crankcase bleeding and bleeding channel.
- Insert new gasket (arrow).



- Mount crankcase bleeding (2) and tighten screws (1).

**A03 060**

Checking the cylinder



Commercial available tools:

- Micrometer gauge
- Internal precision measuring device

Special tools:

- Meter. 100 400



– W 02-09-03



The crankshaft bearing cover must be mounted properly for measuring the cylinders.

If the limit of wear is reached, it is possible to rework the crankcase for further use. Use pistons and piston rings according to the repair stage.

Checking the cylinders

- Remove piston and con rod.



W 02-09-03

- Check cylinders for visible signs of wear.



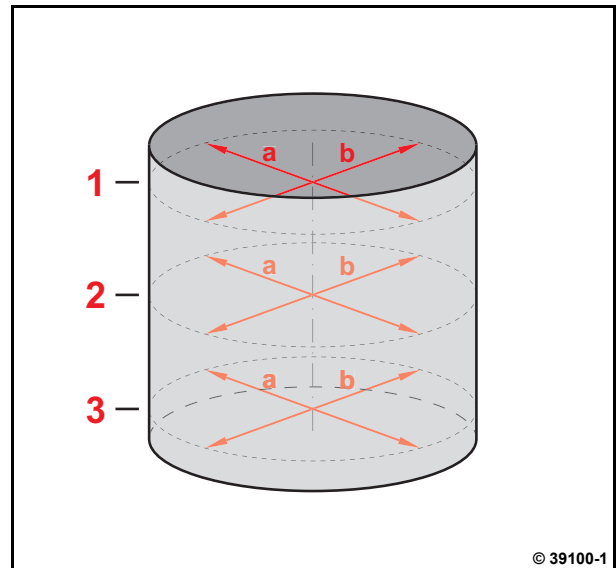
Check the cylinder running surface

- Prepare internal precision measuring device
 - Mount probe bolt for the appropriate measuring range in the internal precision measuring device.
 - Mount meter with **approx. 1 mm** pre-tension in the internal precision measuring device.
 - Set micrometer gauge to **98 mm**.
 - Balance the internal precision measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to **zero**.





Schematic representation for measuring the cylinder running surface at the points (a and b) in the levels (1 and 2).



6

- Insert the internal precision measuring device and measure the cylinder.
- Balance the internal precision measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.



P03 31

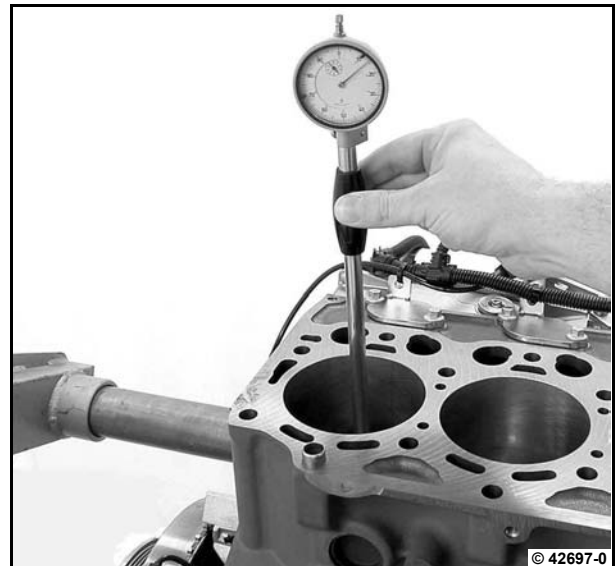


Measuring points, see schematic representation.

- Install piston and con rod.



W 02-09-03



Removing and installing the front cover (opposite side to flywheel)



Commercial available tools





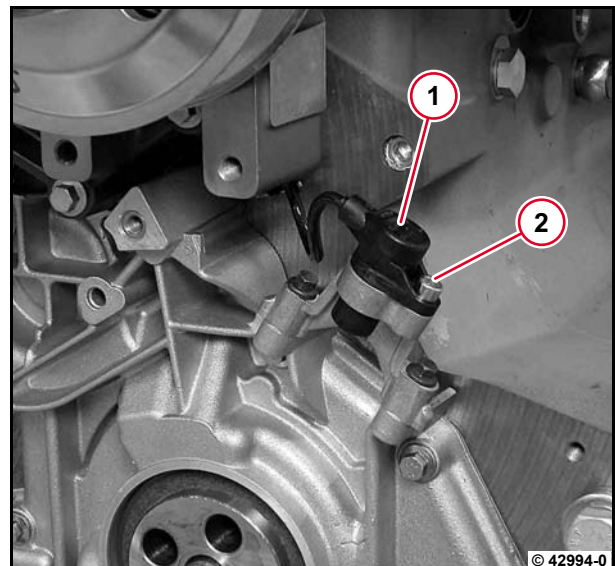
– Sealant DEUTZ DW 59



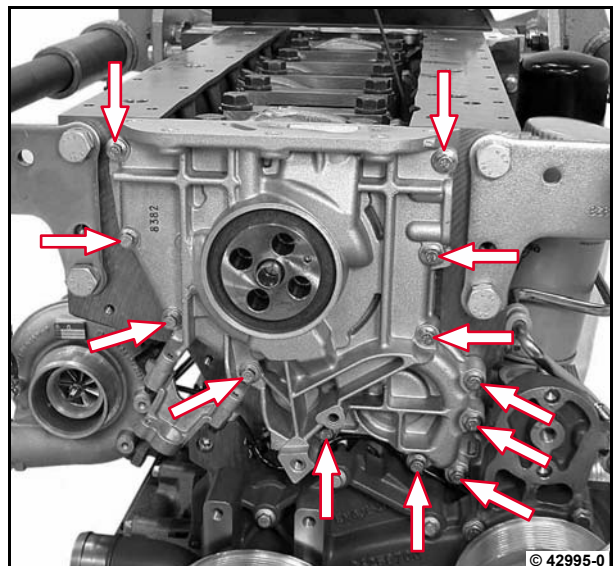
– W 02-02-04
– W 08-04-06
– W 12-01-04

Removing the front cover

- Remove torsional vibration damper.
 W 12-01-04
- Unscrew screw (2) and pull the speed governor (crankshaft) (1) out of the holder.
- Remove oil suction pipe.
 W 08-04-06



- Unscrew screws (arrows) and remove front cover.



- Visually inspect the components .



Installing the front cover

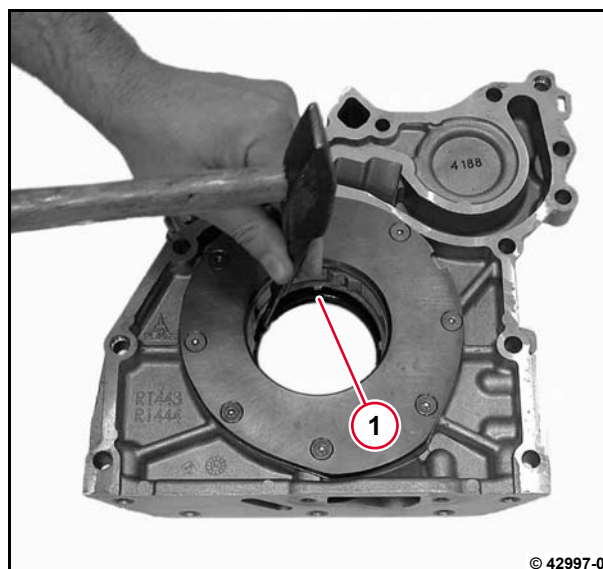
- Knock out crankshaft sealing ring (1).



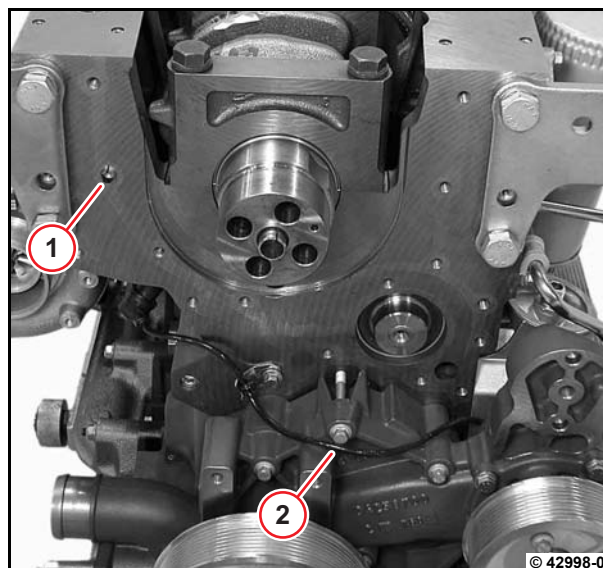
Attention!

Do not damage the sealing surface when knocking out.

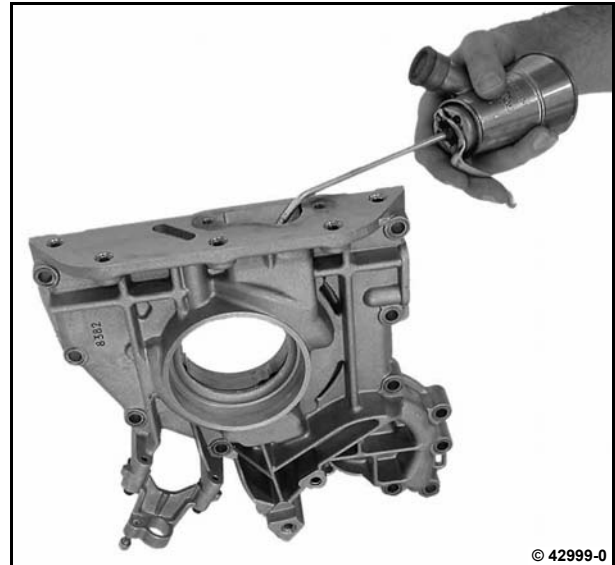
- Clean the sealing surfaces on the front cover and crankcase.



- Make sure the clamping sleeve (1) is in place.
- Pull the cable (2) forward slightly.



- Fix the new gasket to the crankcase with a little grease.
- Oil the oil pump rotors in the front cover lightly.



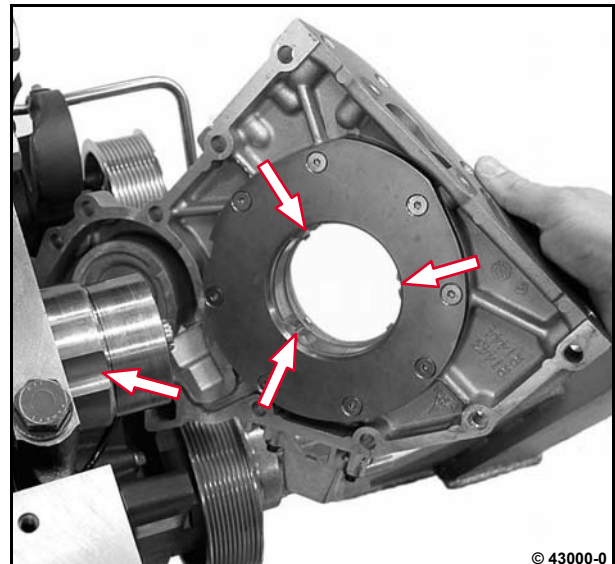
6

- Position the inner rotor to the crankshaft.



The countersinks on the crankshaft and the guides on the inner rotor must match (arrows).

The inner rotor and crankshaft only match up in one position.



- Mount the front cover and tighten the screws.

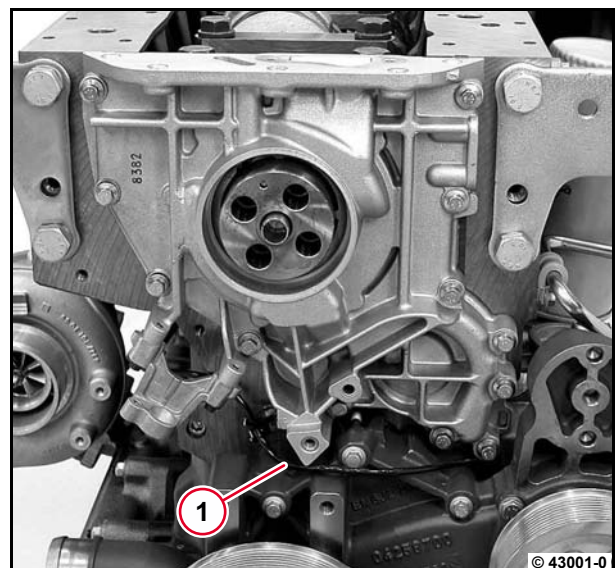


Attention!

Do not trap the cable (1) when mounting the front cover.



Do not tighten screws.

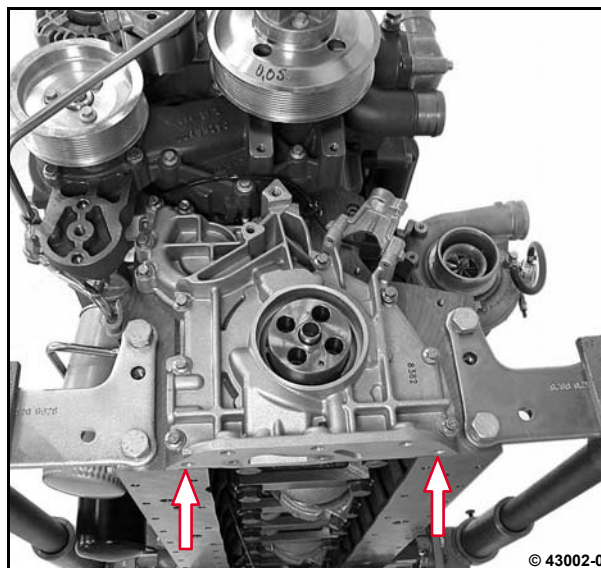


- Turn engine **180°**.



The oil tray sealing surface on the crankcase must face downwards.

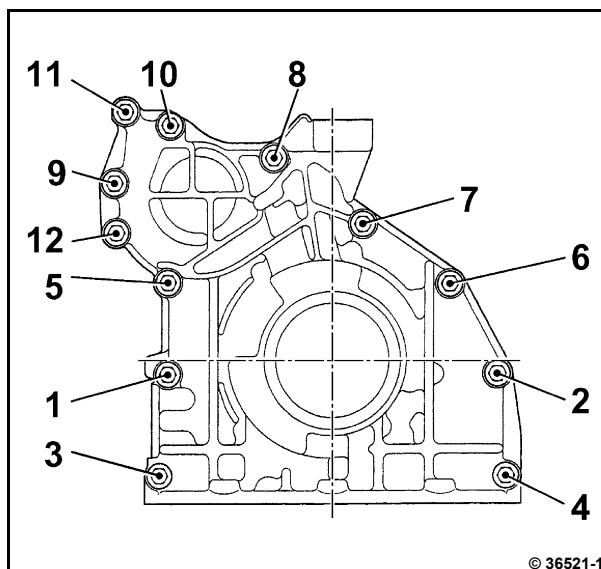
- Press up front cover and align flush with the oil tray sealing surface (arrows).



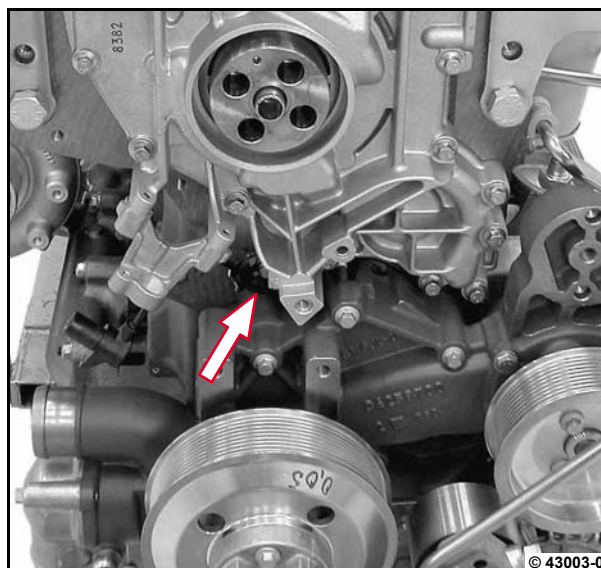
- Tighten the screws alternately or in the tightening order.



A03 020

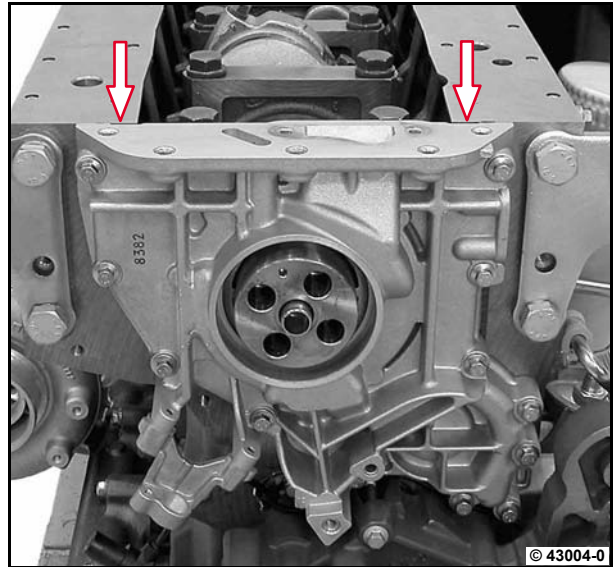


- Turn engine **180°**.
- Lay the cable (arrow) between the front cover and the fan console.



- Cut off overhanging gasket(arrows) flush with the sealing surface of the oil tray.
- Install oil suction pipe.

 W 08-04-06



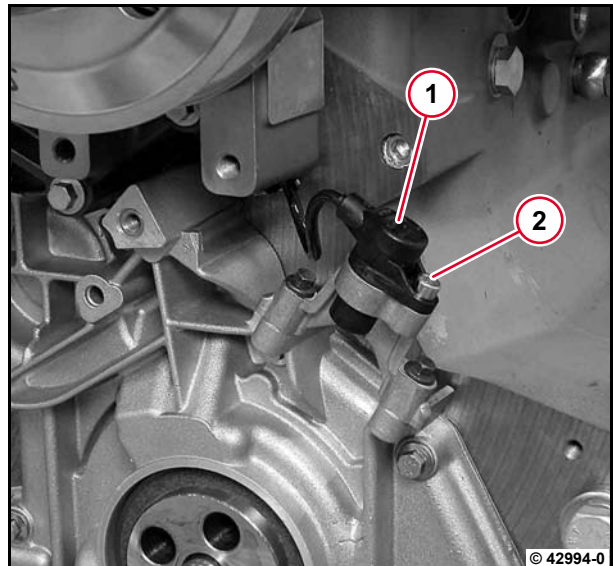
6

- Insert speed governor (crankshaft) (1) and tighten screw (2).

 A05 011



Clean the threads of the screw and hole.
Insert screw with sealant.

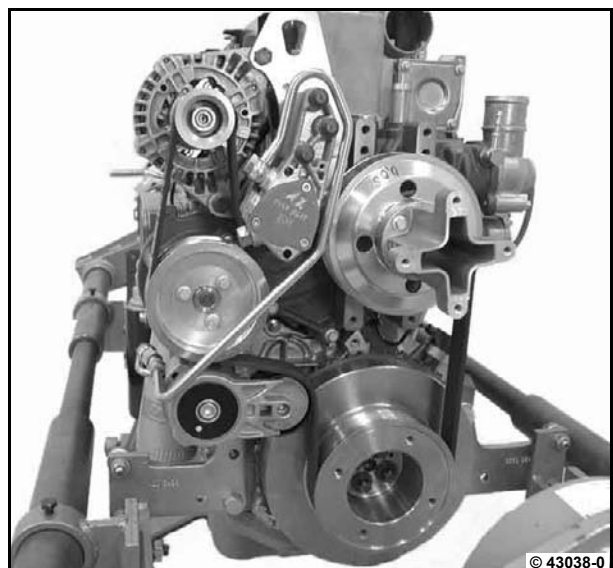


- Install crankshaft sealing ring (flywheel side).

 W 02-02-04

- Install torsional vibration damper.

 W 12-01-04



Removing and installing the connection housing



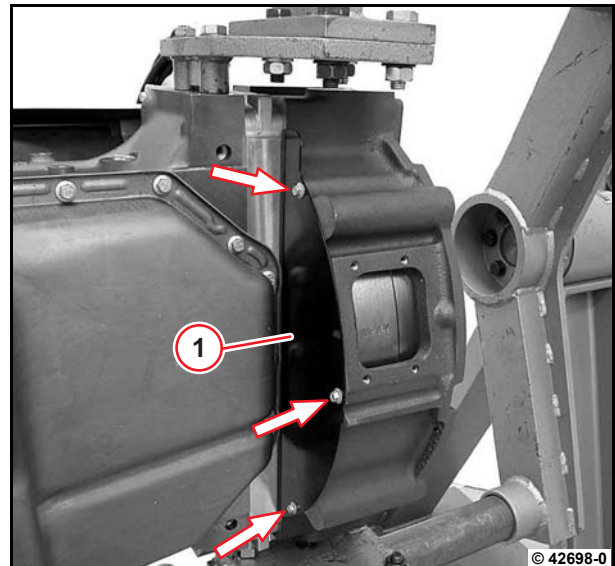
Commercial available tools:

- Socket wrench set 8113
- Socket wrench set 8114

6

Removing the connection housing

- Unscrew screws (arrows) and remove cover plate (1).

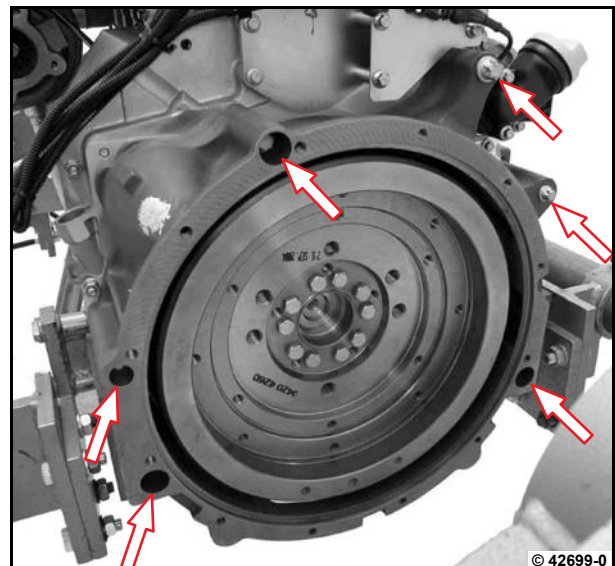


- Unscrew screws (arrows) and remove connection housing.



Use socket wrench sets.

- Visually inspect the components .

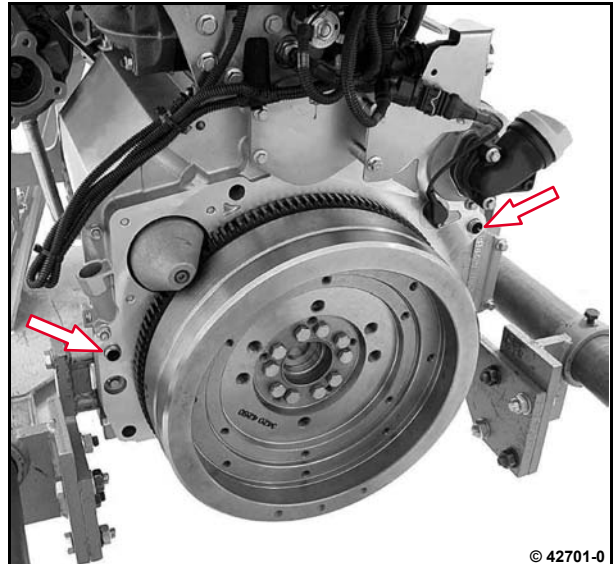


Installing the connection housing

- Clean contact surfaces on connection housing and gearcase cover.



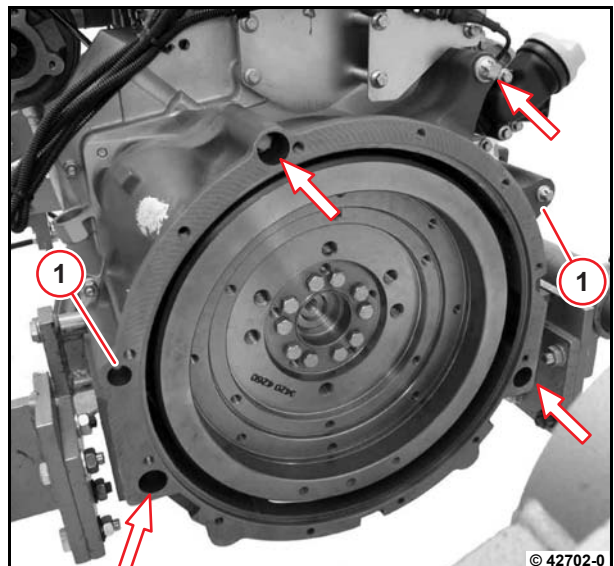
- Make sure the clamping sleeves (arrows) are in place.
- Mount the connection housing and center over the clamping sleeves.



- Turn on screws.



Note different screw length:
Screws M12 x 150 mm (1)
Screws M16 x 140 mm (arrows)



- Tighten screws (1).

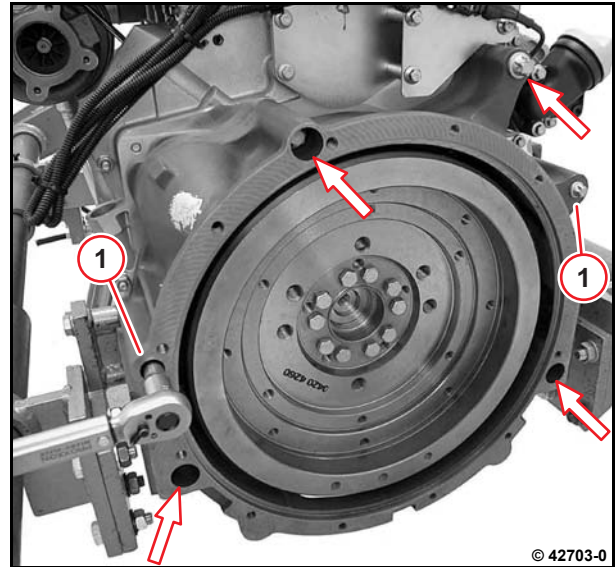
 A03 080

- Tighten screws (arrows) alternately.

 A03 080



Use socket wrench sets.



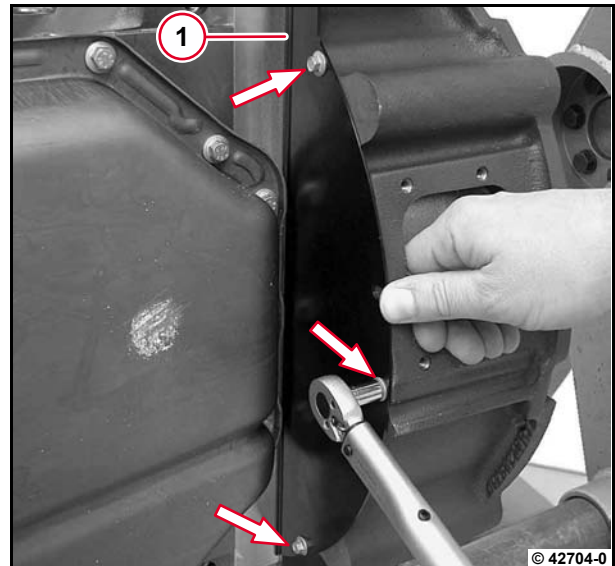
6

- Press the cover plate onto the gearcase to the stop and tighten the screws (arrows).

 A03 085



The hollow gorge (1) must face the lube oil tray.



Removing and installing the gearcase



Commercial available tools




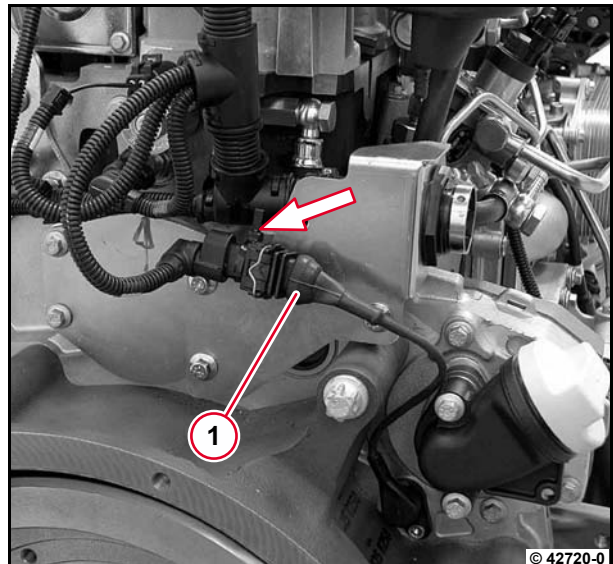
– Packing compound
DEUTZ DW 67



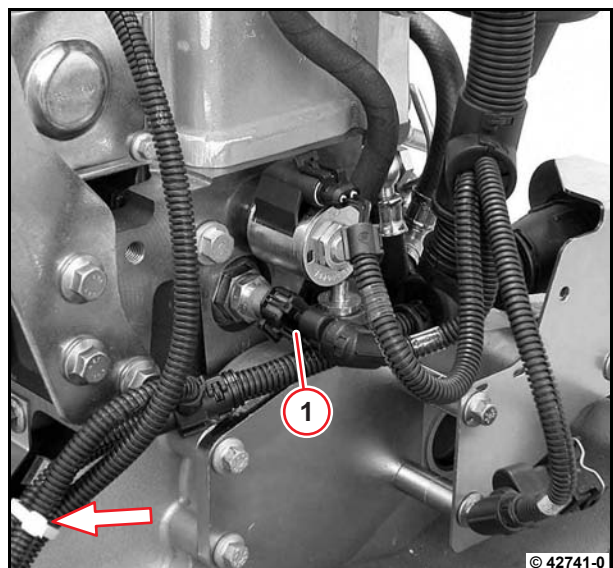
– W 02-02-02
– W 03-09-04
– W 08-04-07
– W 12-06-01
– W 13-02-03

Remove gearcase

- Remove starter.
 W 13-02-03
- Unlock and disconnect the cable plug (1) of the impulse transmitter (camshaft).
- Remove cable tie (arrow) and expose cable harness.



- Unlock cable plug (1) and remove coolant temperature sensor.
- Remove cable tie (arrow) and expose cable harness.



- Unscrew nut (1), pull central plug (2) out of holder.
- Remove connection housing.

 W 03-09-04

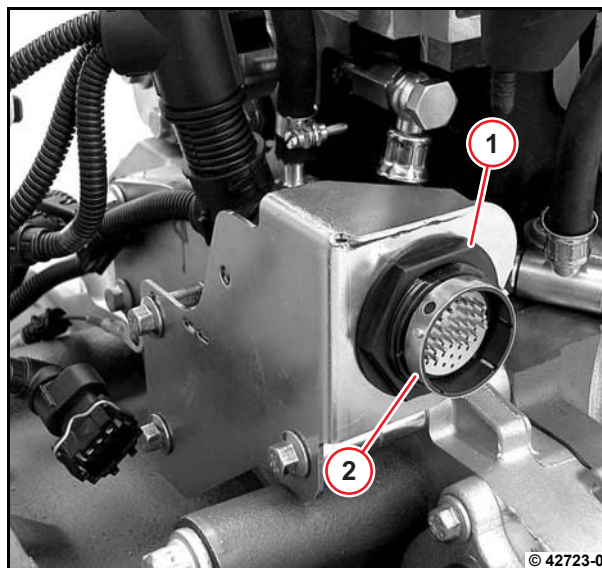
- Remove flywheel.

 W 12-06-01

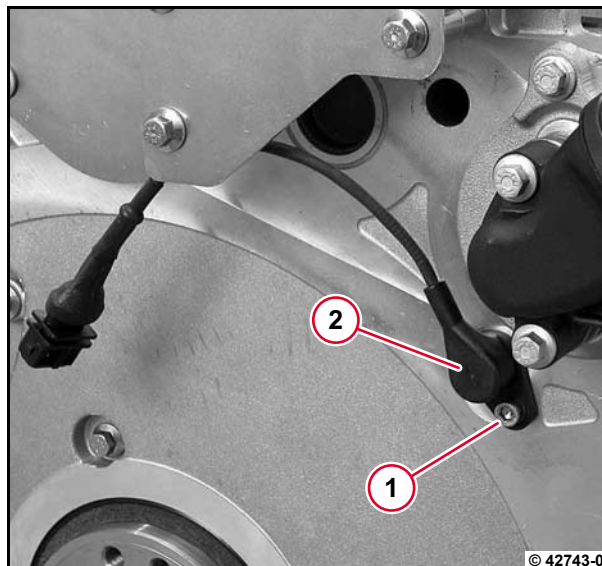
- Remove lube oil tray.

 W 08-04-07

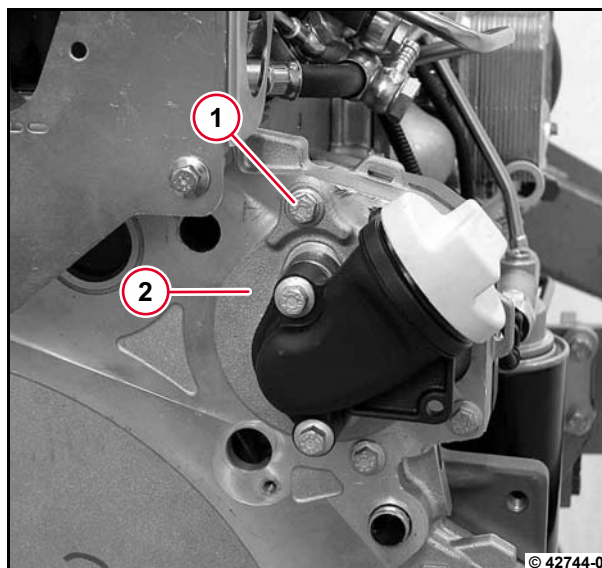
- Turn engine by **180°**.



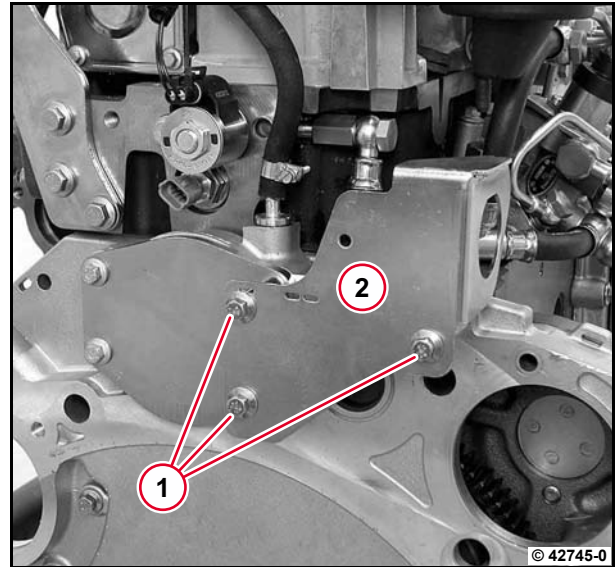
- Unscrew screw (1) and remove impulse transmitter (2).



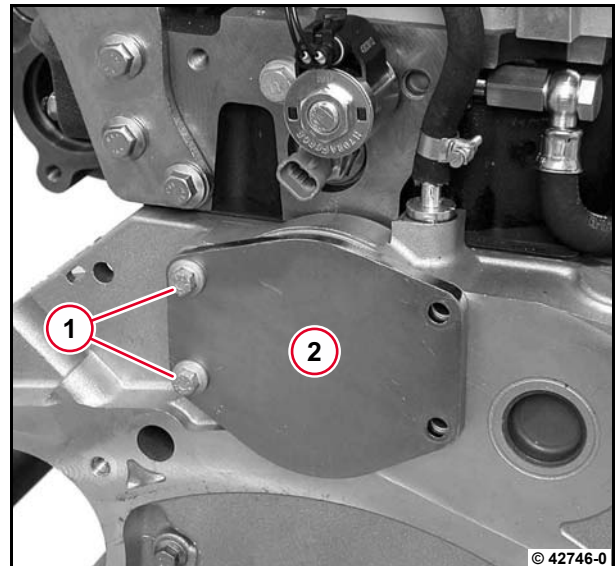
- Unscrew screw (1), remove cover (2) with oil filling nozzles.



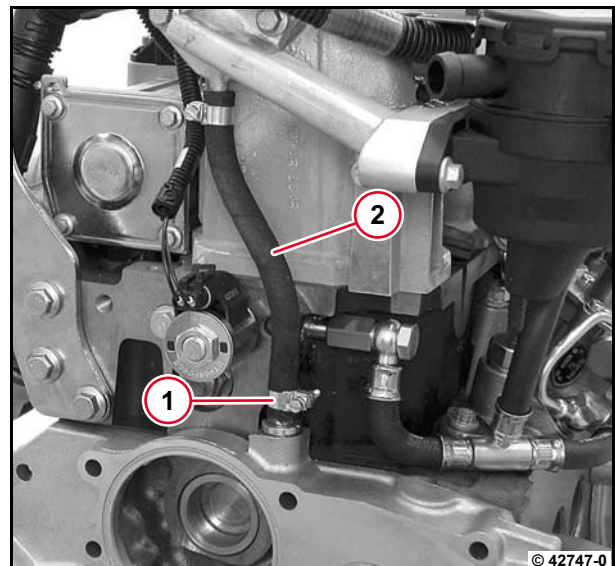
- Unscrew screws (1) and remove holder (2) and spacing sleeves.



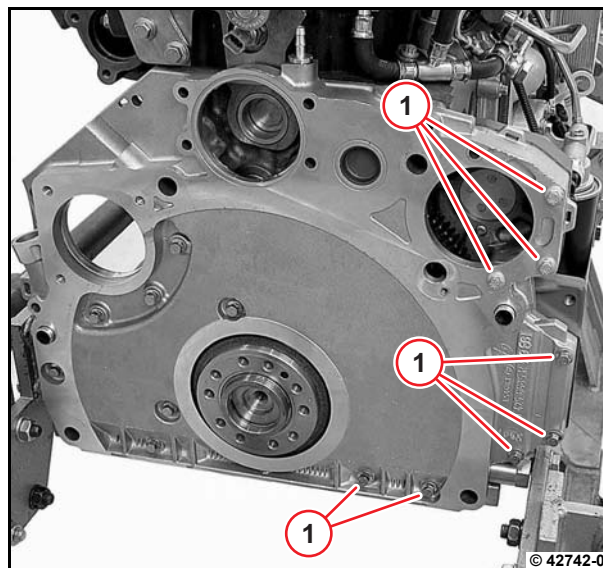
- Unscrew screws (1) and remove cover (2).



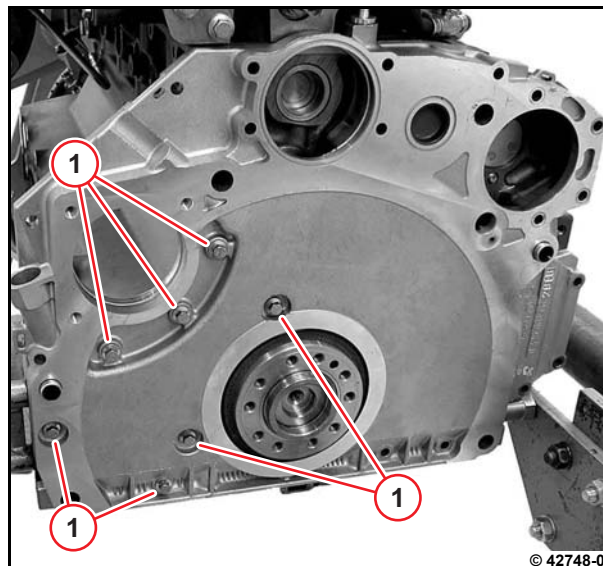
- Loosen hose clip (1), pull oil return line (2) off hose nozzle.



- Unscrew screws (1).



- Unscrew screws (1) and remove gearcase cover.



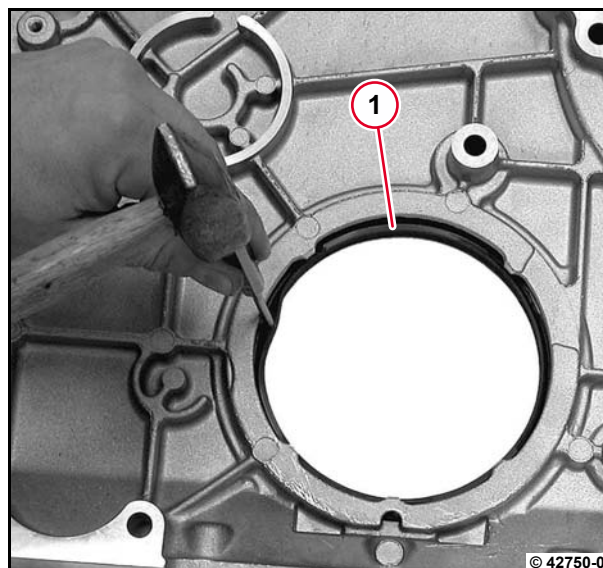
Installing gearcase cover

- Knock out crankshaft sealing ring (1).



Attention!

Do not damage the sealing surface when knocking out.



- Clean the sealing surfaces on the gearcase cover and crankcase.
- Apply packing compound to the gearcase cover (arrows).

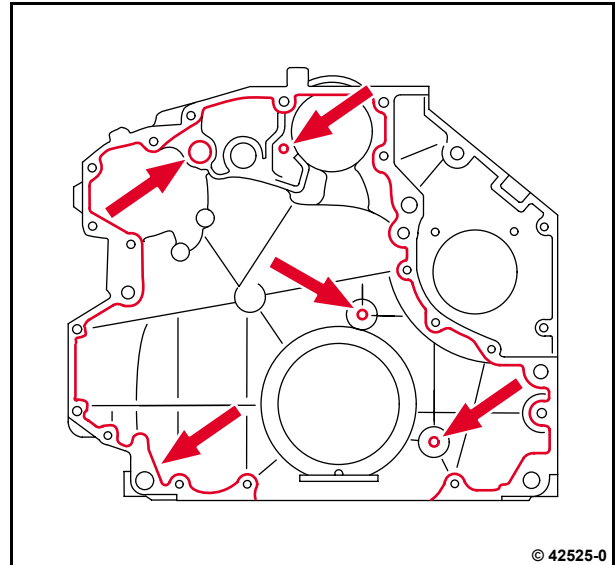


Attention!

Assembly of the gearcase must be completed within a maximum of 1 hour after applying the packing compound.



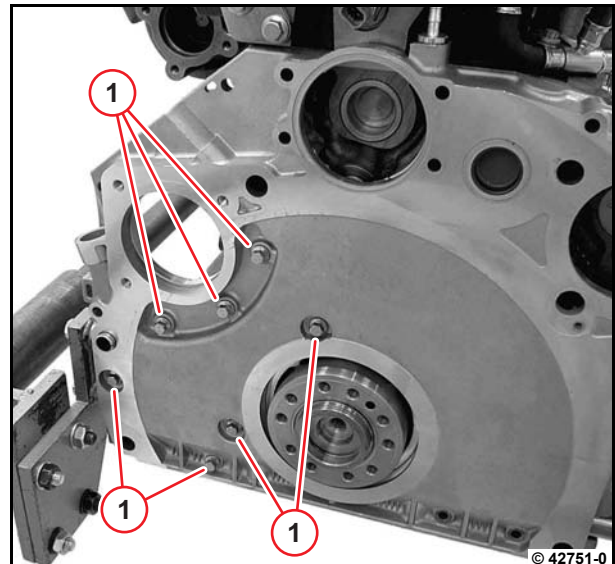
The thickness of the sealing bead must be **about 1.4 mm**.



- Mount the gearcase cover and fasten the screws (1).



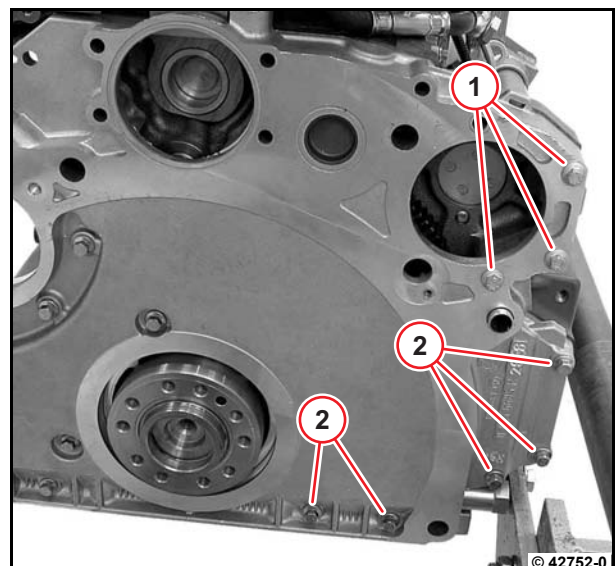
Do not move the packing compound when mounting the gearcase cover.
Do not tighten screws.



- Fasten screws.



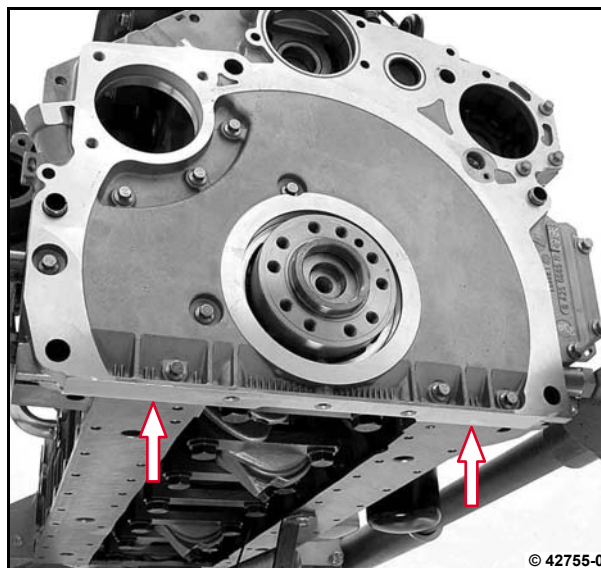
Note different screw length:
- screws M8 x 45 mm (1)
- screws M8 x 35 mm (2).
Do not tighten screws.



- Press up gearcase cover and align flush with the oil tray sealing surface (arrows).



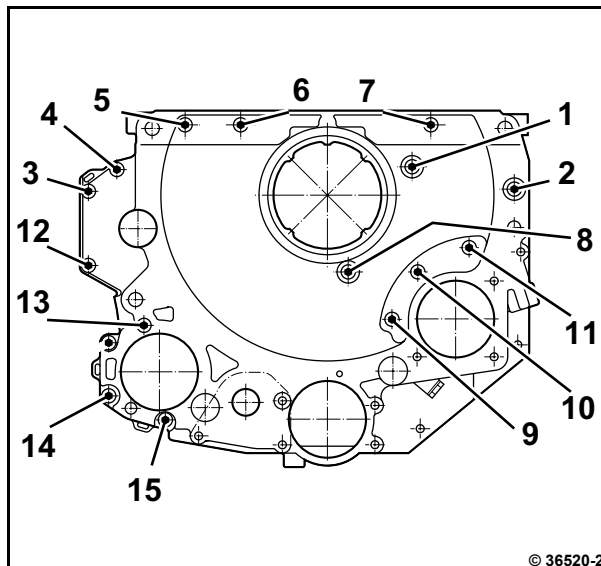
The oil tray sealing surface on the crankcase must face downwards.



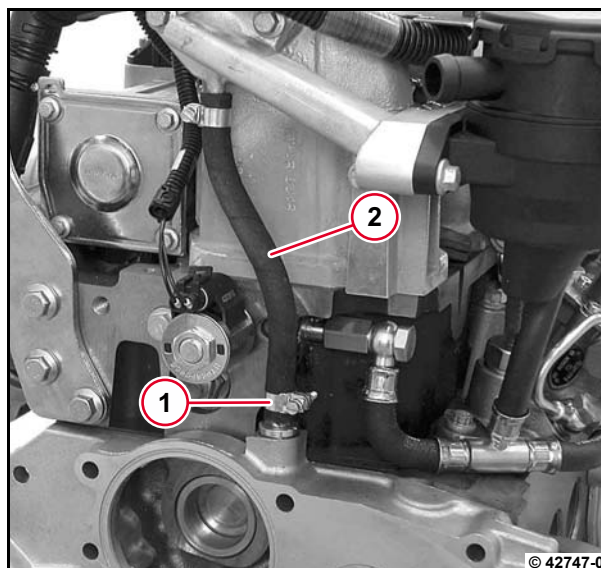
- Tighten the screws alternately in the tightening order.



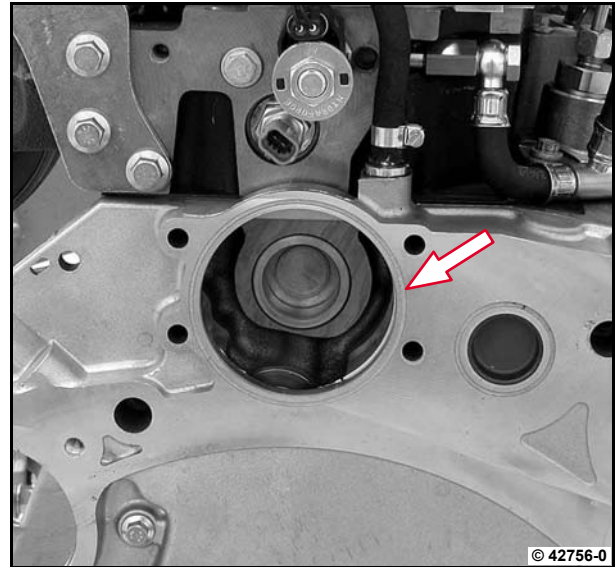
A03 092



- Plug the oil return line (2) to the hose nozzle and fix the hose clip (1).



- Clean the sealing surface on cover and gearcase.
- Fill the ring groove (arrow) in the gearcase cover with packing compound.



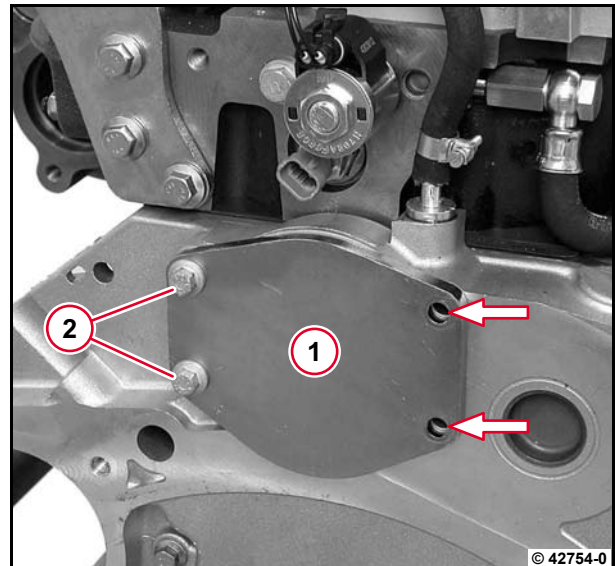
6

- Mount the cover (1) and tighten the screws (2).

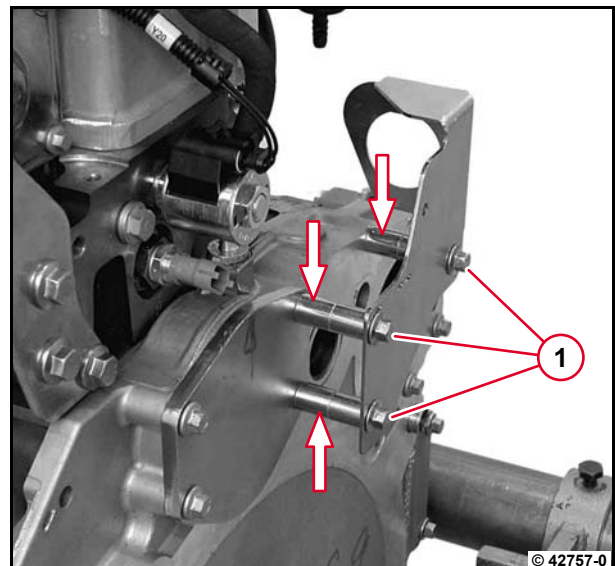


Note the installation position of the cover (1).

The holes (arrows) in the cover (1) must be in line with the holes in the gearcase cover.

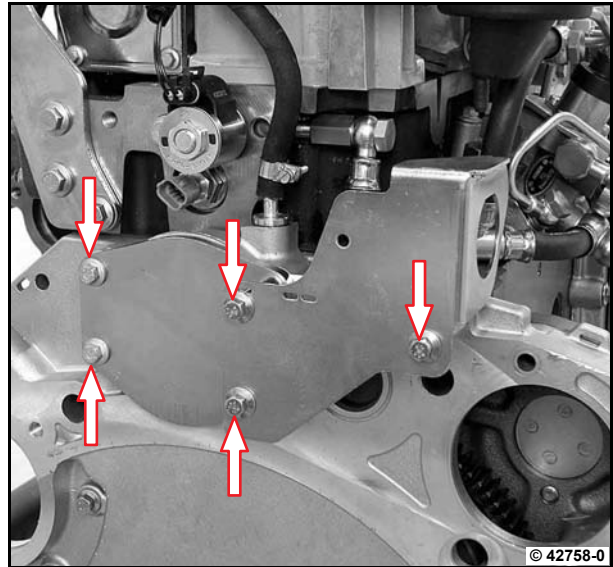


- Mount holder with spacing sleeves (arrows) and tighten screws (1).



- Tighten screws (arrows) alternately.

 A03 092

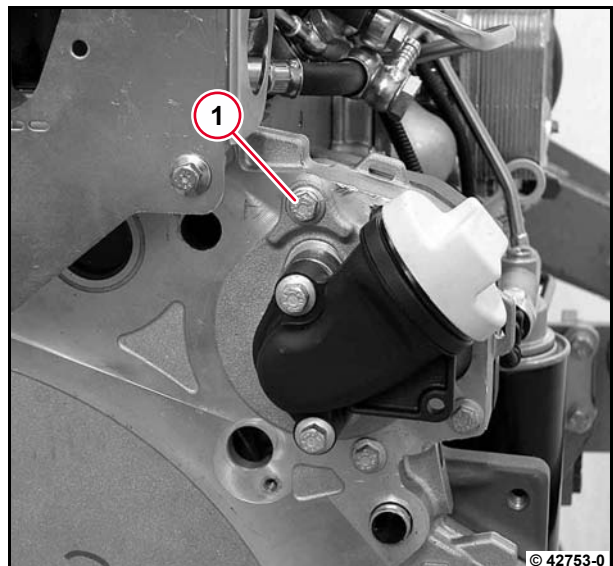


- Clean the sealing surface on cover and gearcase.
- Pull new O-ring (arrow) onto cover.
- Lightly oil O-ring.

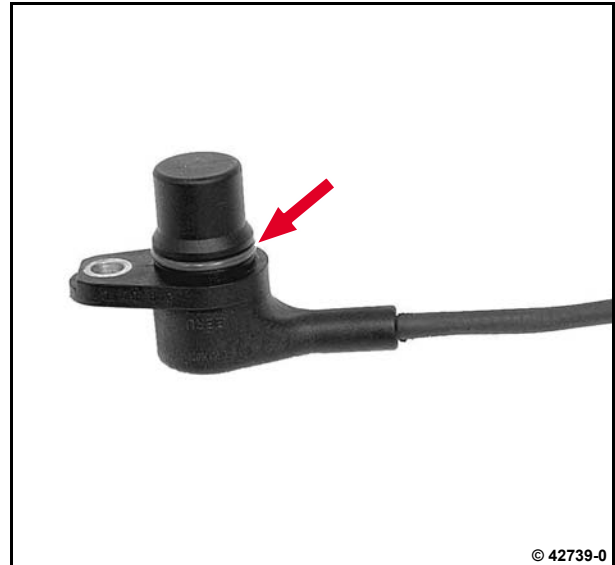


- Press in cover to stop and tighten screw (1).

 A04 022



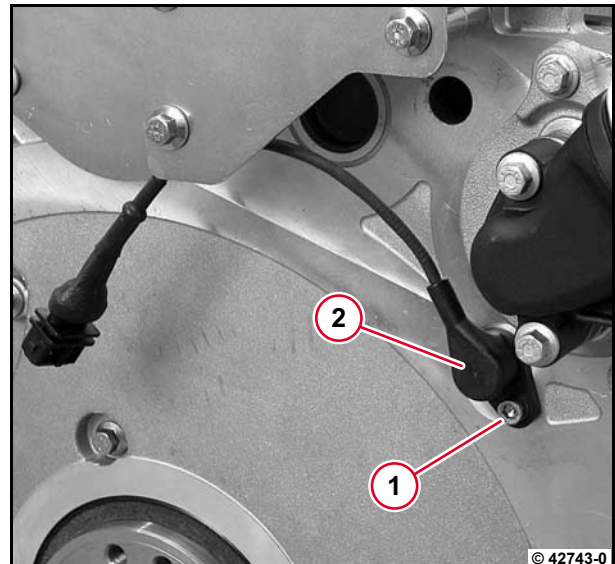
- Clean the sealing surface on the impulse transmitter and gearcase.
- Pull O-ring (arrow) onto impulse transmitter.
- Lightly oil O-ring.



6

- Insert impulse transmitter (2) and tighten the screw (1).

 A05 013



- Install new crankshaft sealing ring (flywheel side).

 W 02-02-02

- Install flywheel.

 W 12-06-01

- Install connection housing.

 W 03-09-04

- Install starter.

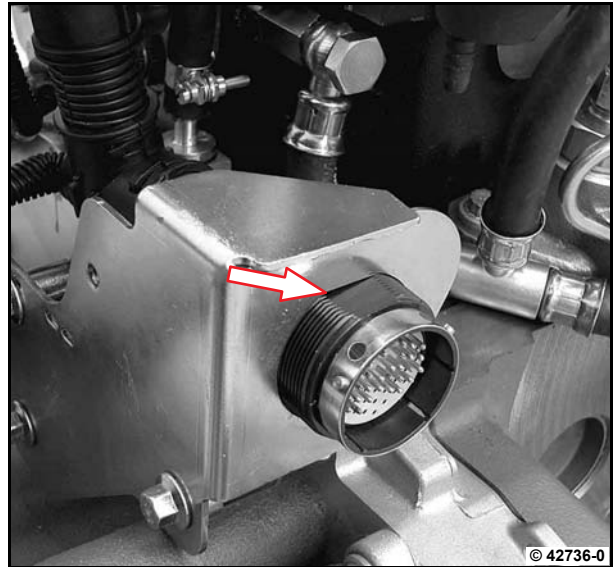
 W 13-03-02



- Plug central plug into the holder and tighten the nut.



The flattened side of the central plug and the holder must be in line (arrow).

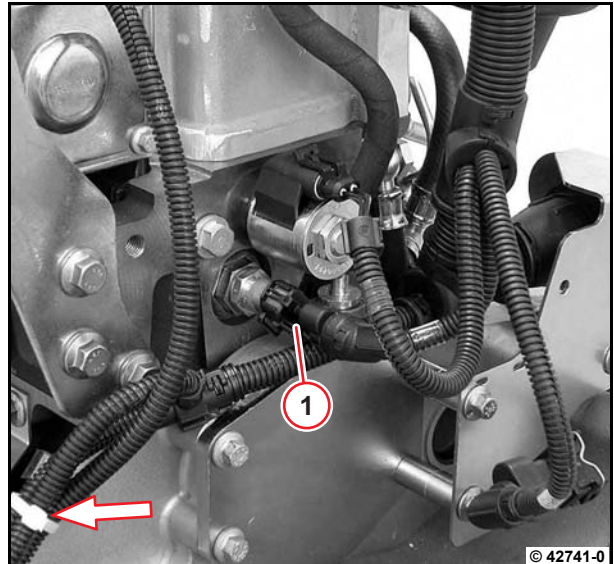


- Plug cable plug (1) into coolant temperature sensor.



Ensure that the connection is perfect.

- Lay cable harness and fix with cable tie (arrow).



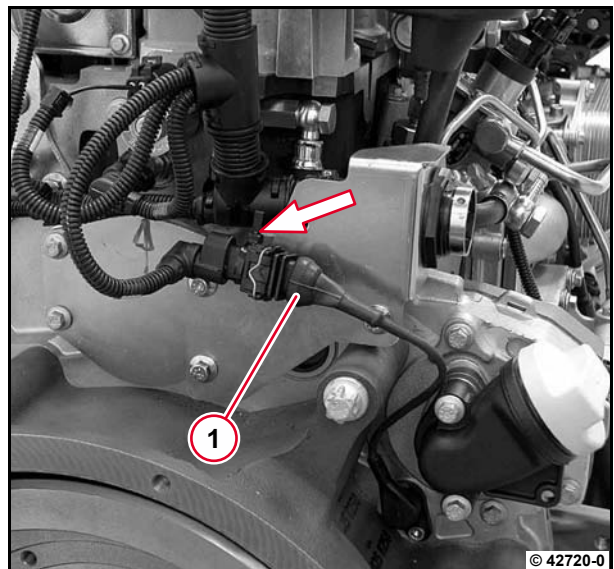
- Plug together the cable plugs (1) of the impulse transmitter (camshaft).



Ensure that the connection is perfect.

- Lay cable harness and fix with cable tie (arrow).
- Turn engine by **180°**.
- Install lube oil tray.

 [W 08-04-07](#)



Remove and install camshaft



Commercial available tools:

- Hoisting equipment
- Carrying side



- W 01-02-02
- W 02-04-01
- W 07-15-04
- W 07-15-05

Removing camshaft

- Remove high pressure pump and roller tappet (installation position A).

 W 07-15-04

- Remove high pressure pump and roller tappet (installation position B).

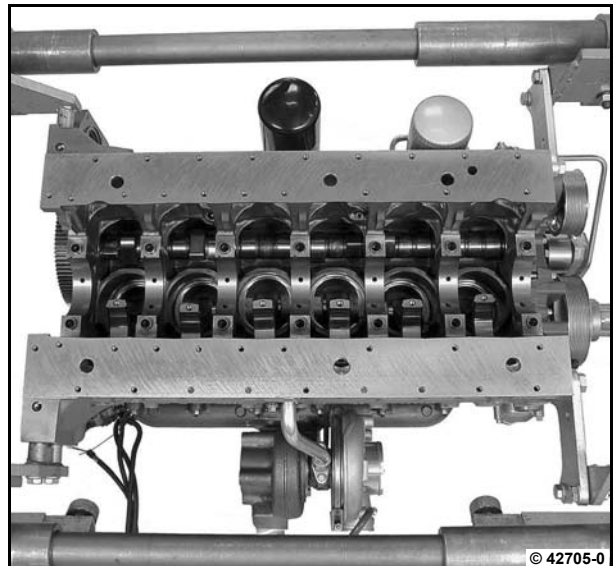
 W 07-15-05

- Remove rocker arms and rocker arm brackets.

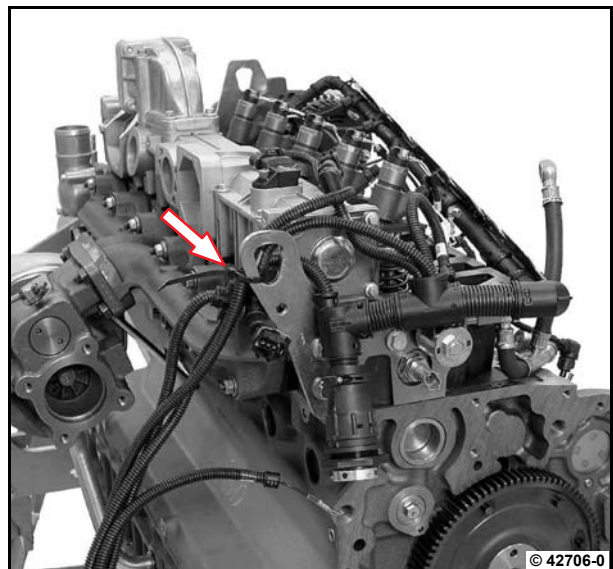
 W 01-02-02

- Dismantle crankshaft.

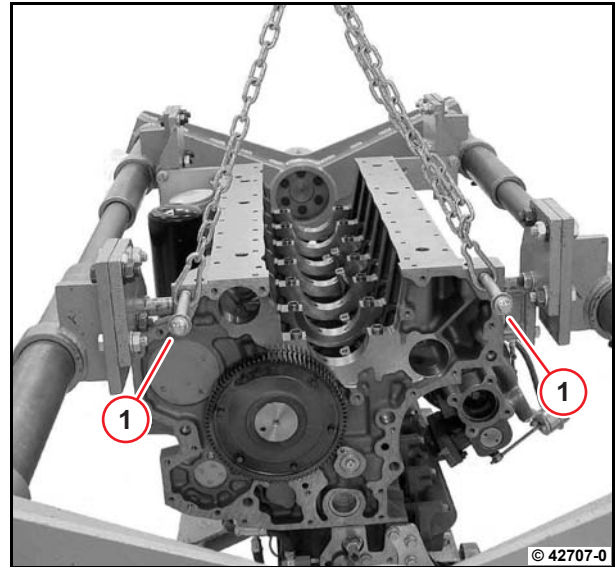
 W 02-04-01



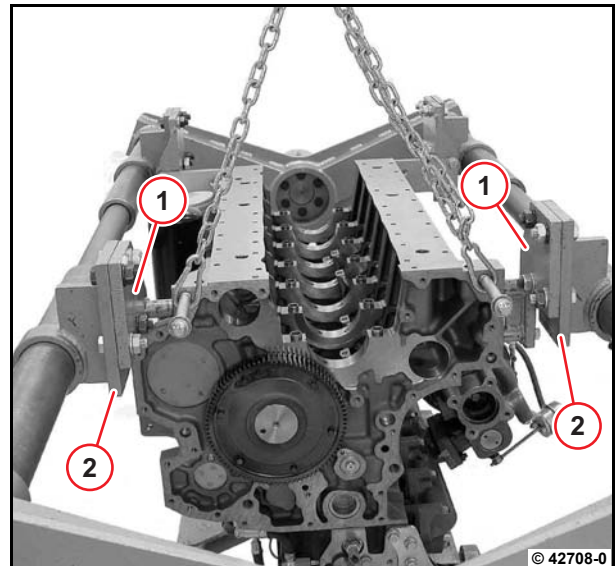
- Fix cable harness to transport flange (arrow).



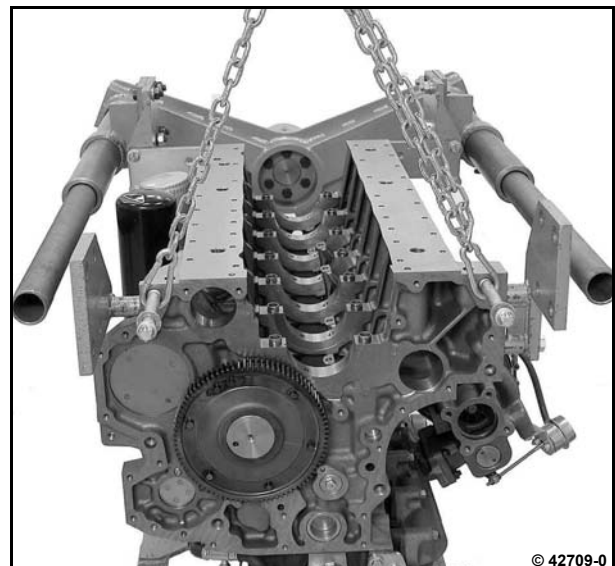
- Fasten screws (1).
- Hang crankcase on suitable workshop crane.



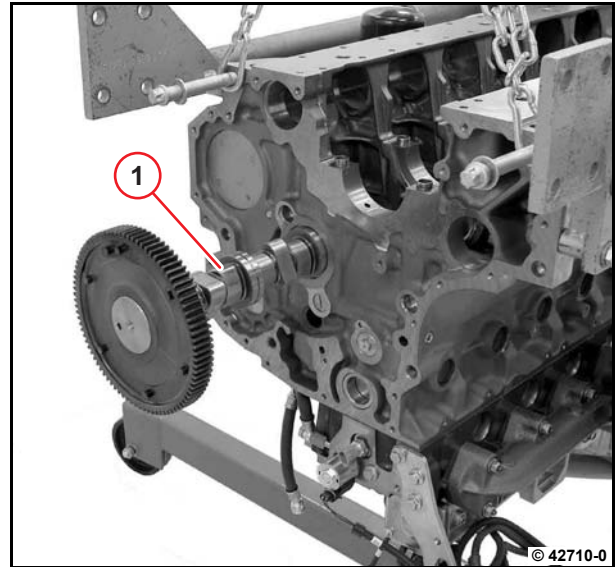
- Remove the clamping bracket (1) from the adapter plates (2).



- Push away the assembly block on the flywheel side.



- Press in all tappets.
- Pull out the camshaft (1) carefully to the flywheel side.



6

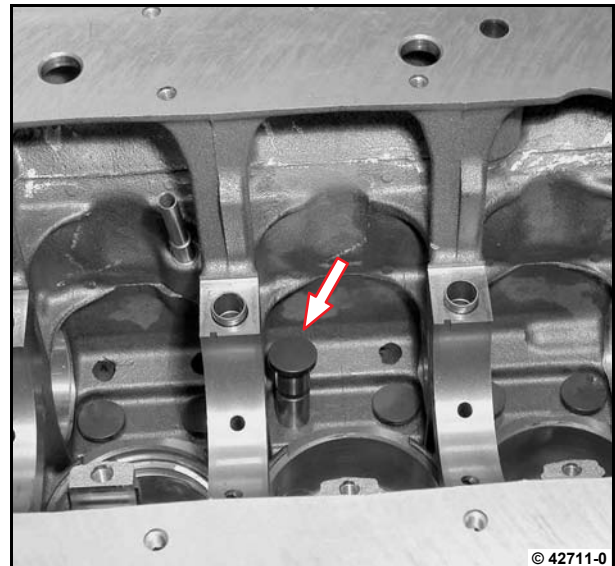
Removing tappets.

- Remove all tappets (arrow).



Put down the components in the order of assembly, note order of cylinders.

- Visually inspect the components.

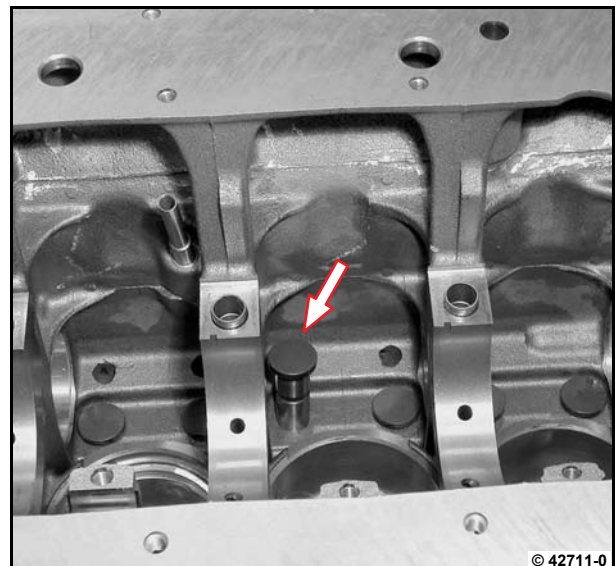


Installing tappets

- Lightly oil all tappets (arrow) and insert.



Note assignment.

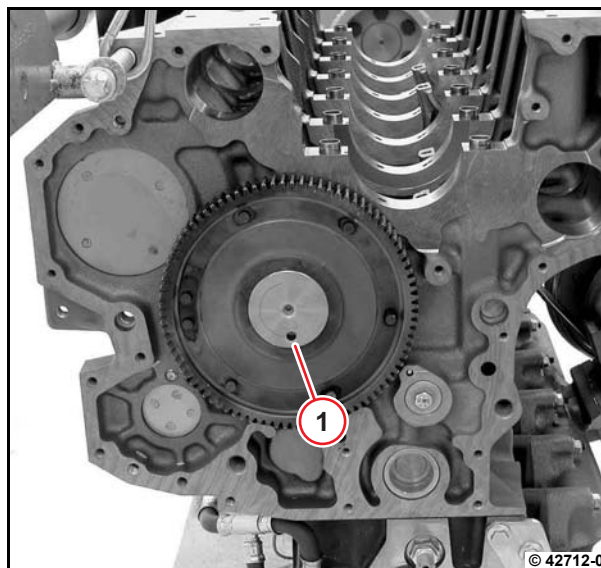


Installing camshaft

- Lightly oil camshaft bearing and camshaft pin.
- Insert camshaft carefully.



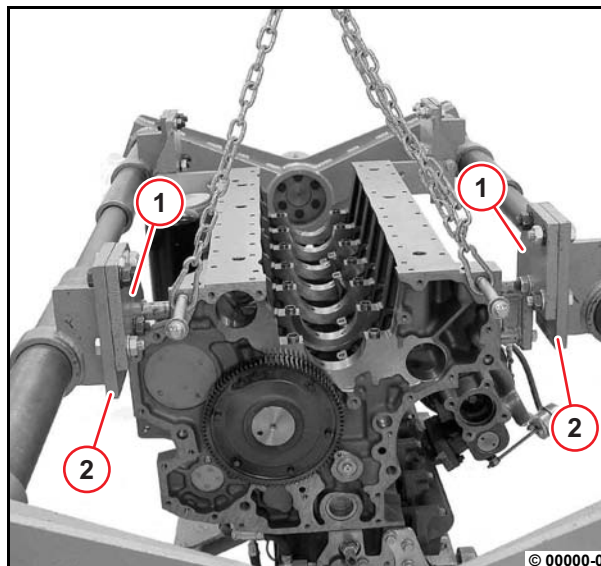
The bore (1) must be facing the cylinder head.



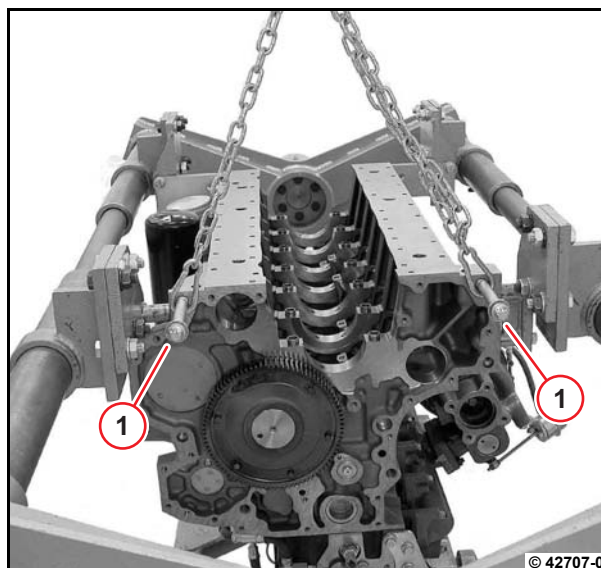
- Push on and align the flywheel side assembly block.
- Remove the clamping bracket (1) from the adapter plates (2).



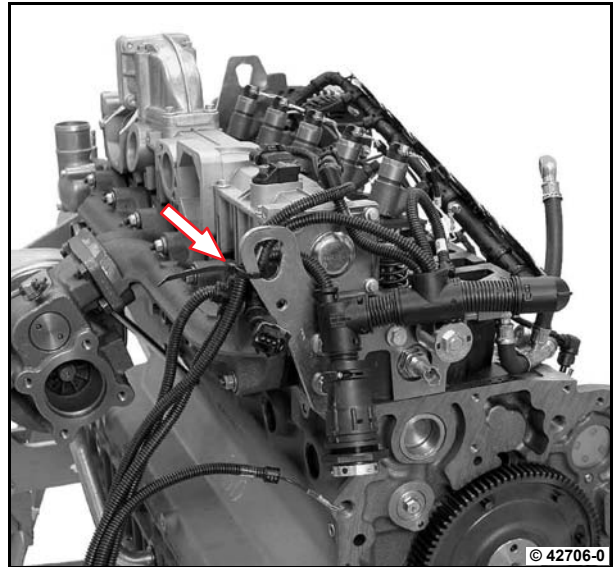
A00 002







- Unhook the crankcase from the workshop crane and unscrew the screws (1).

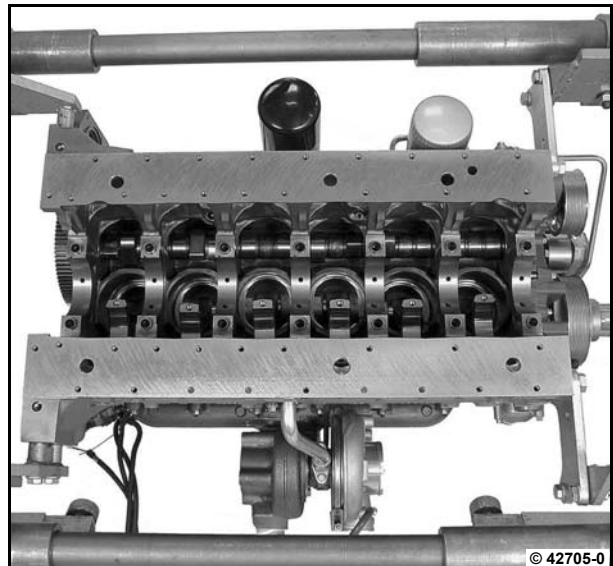


- Disconnect cable harness from transport flange (arrow).



6

- Install crankshaft.
 W 02-04-01
- Install rocker arms and rocker arm brackets.
 W 01-02-02
- Install high-pressure pump and roller tappet (installation position B).
 W 07-15-11
- Install high pressure pump and roller tappet (installation position A).
 W 07-15-04



Check camshaft



Commercial available tools:
– Micrometer gauge



– W 04-05-05

6

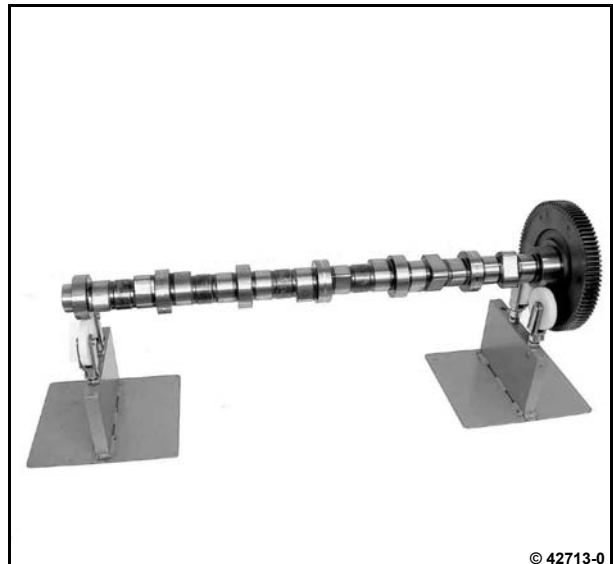
Checking the camshaft

- Remove camshaft.



W 04-05-05

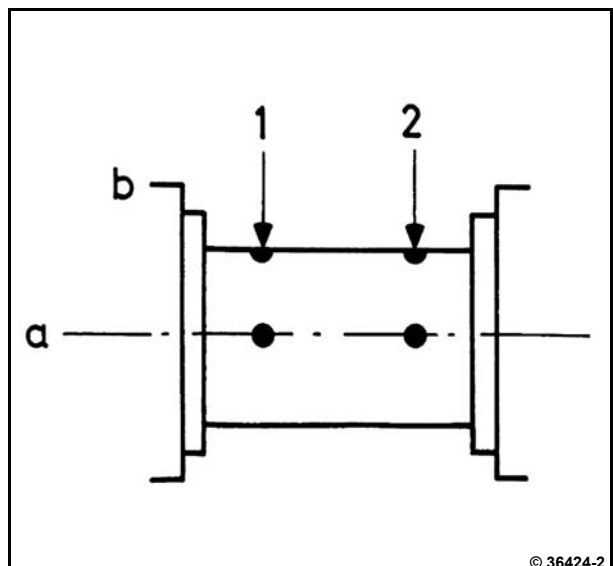
- Visually inspect cams and bearing pins for wear, re-new camshaft if necessary.



© 42713-0



Diagram for measuring the bearing pins at the points (1 and 2) in the levels (a and b).



© 36424-2

Checking the diameter of the bearing pin

- Measure bearing pin with micrometer gauge.

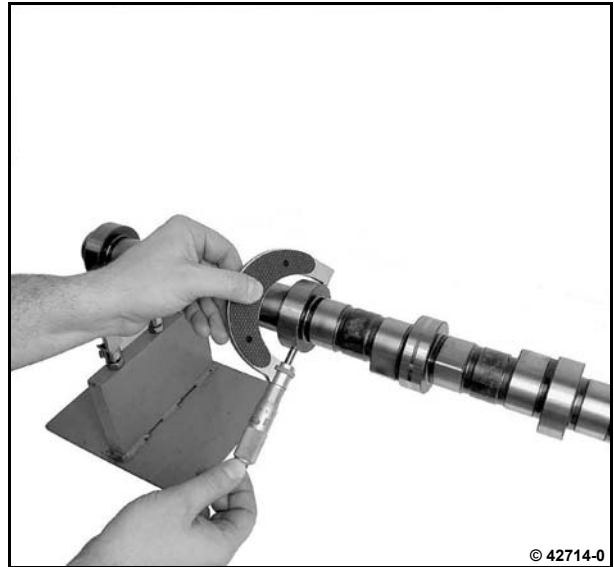


P04 31



Measuring points, see diagram.

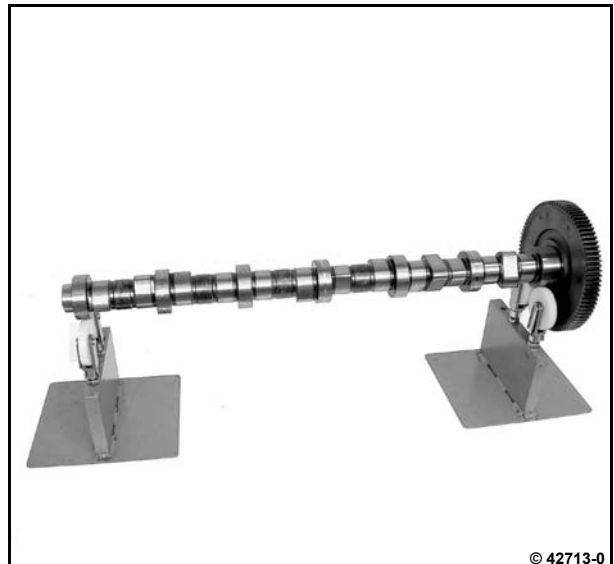
When the limit value is reached the camshaft must be replaced.



- Check camshaft gear wheel for visible signs of wear.
- Install camshaft.



W 04-05-05



Remove and install speed governor (crankshaft)



Commercial available tools

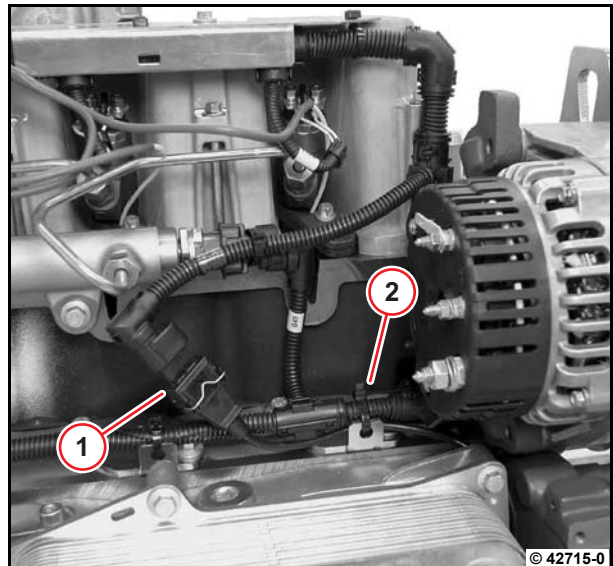


– Sealant DEUTZ DW 72

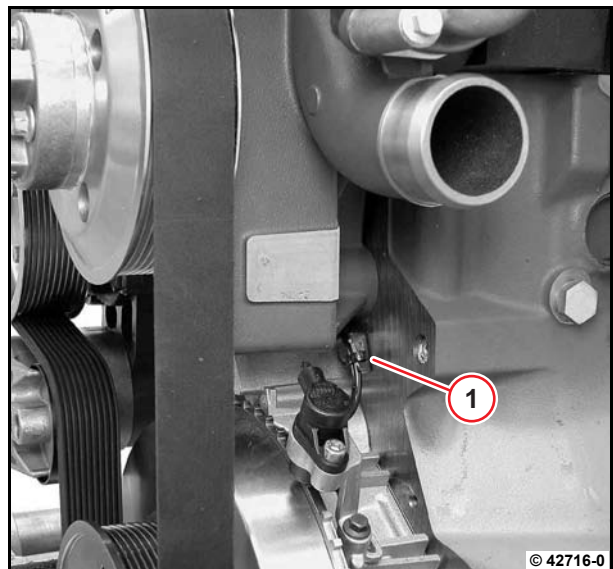
6

Removing impulse transmitter

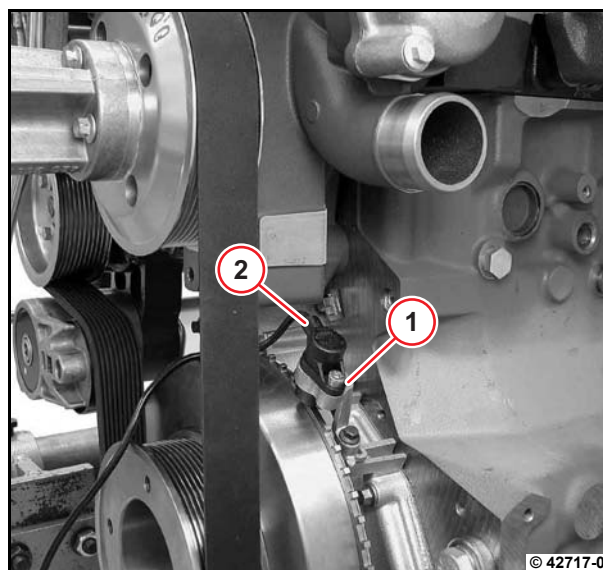
- Unlock cable plug (1) and disconnect.
- Remove cable tie (2).



- Remove cable tie (1) and expose cable.



- Unscrew screw (1) and remove impulse transmitter (2).

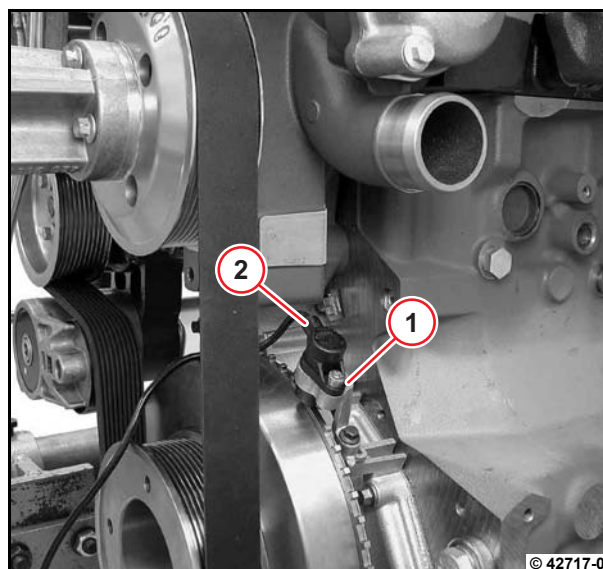


- Insert impulse transmitter (2) and tighten the screw (1).

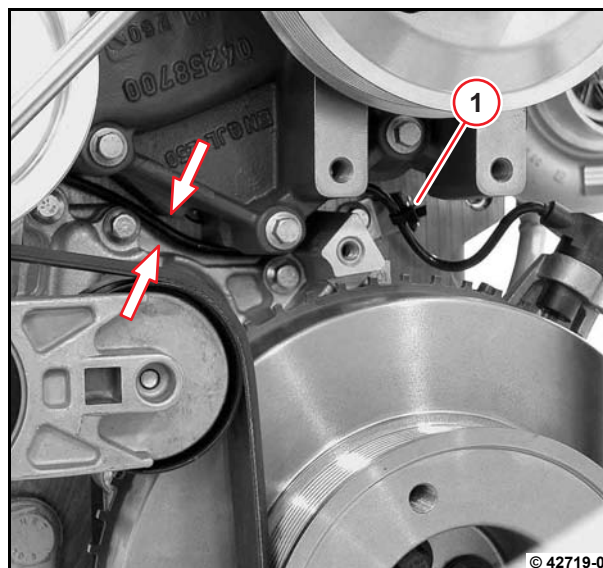
 A05 011




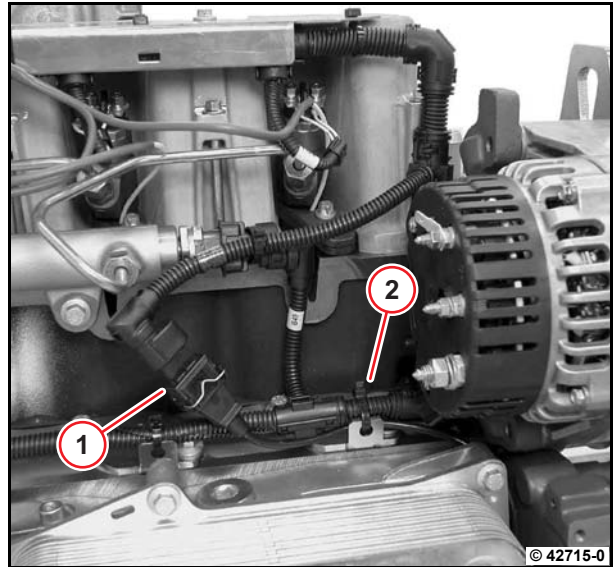
Clean the threads of the screw and hole.
Insert screw with sealant DEUTZ DW 72.



- Lay cable between the front cover and fan console (arrows) and fix with cable tie (1).



- Plug the cable plugs together (1).
- 
- Ensure that the connection is perfect.
- Lay cable and fix with cable tie (arrows).



Remove and install speed governor (camshaft)

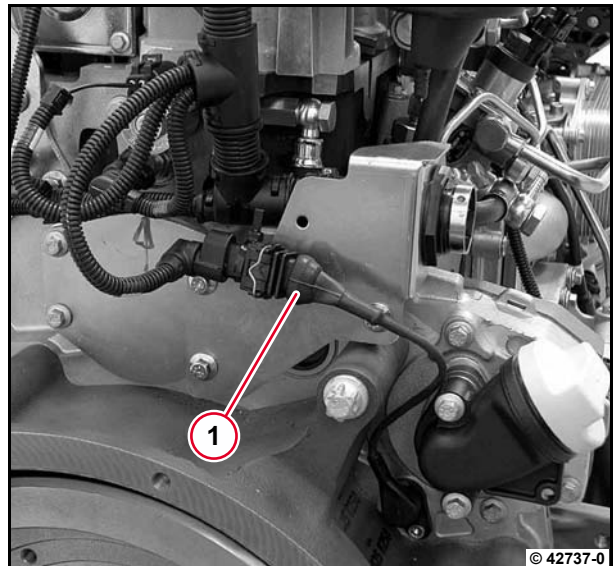


Commercial available tools

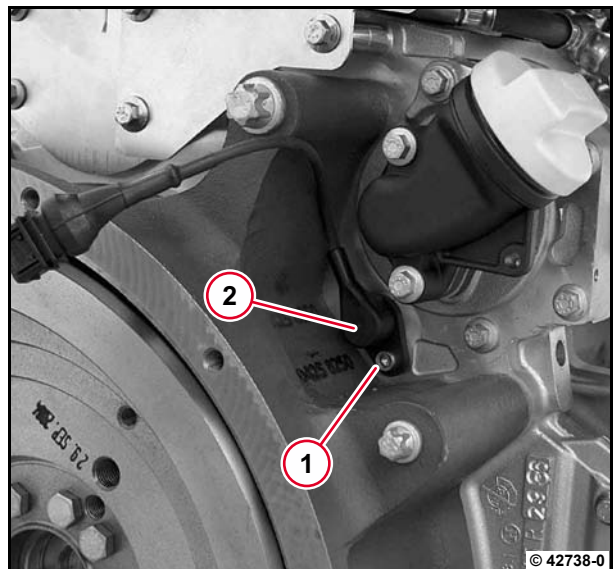
6

Removing impulse transmitter

- Unlock cable plug (1) and disconnect.

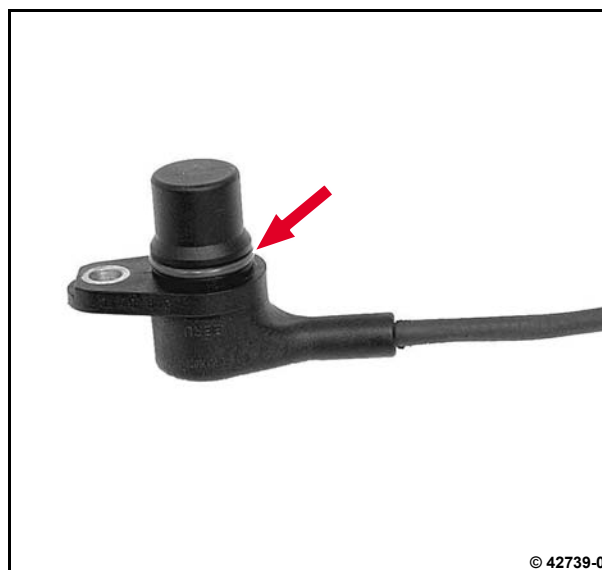


- Unscrew screw (1) and remove impulse transmitter (2).
- Visually inspect the components.



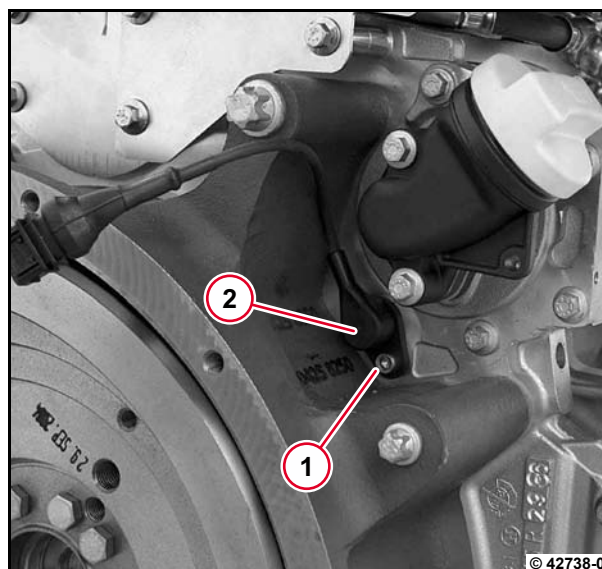
Installing the impulse transmitter

- Clean the sealing surface on the impulse transmitter and gearcase cover.
- Pull new O-ring (arrow) onto impulse transmitter.
- Lightly oil O-ring.



- Insert impulse transmitter (2) and tighten the screw (1).

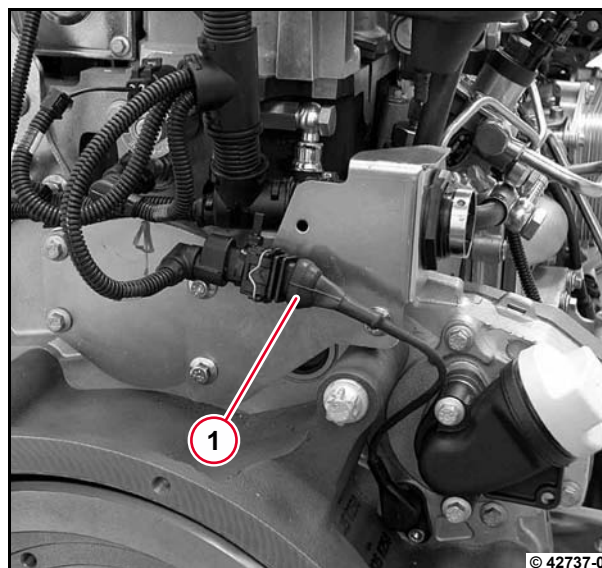
 **A05 012**



- Plug in the cable plug (1).



Ensure that the connection is perfect.



Remove and install exhaust manifold



Commercial available tools



– Fitting compound
DEUTZ S1



– W 06-06-04

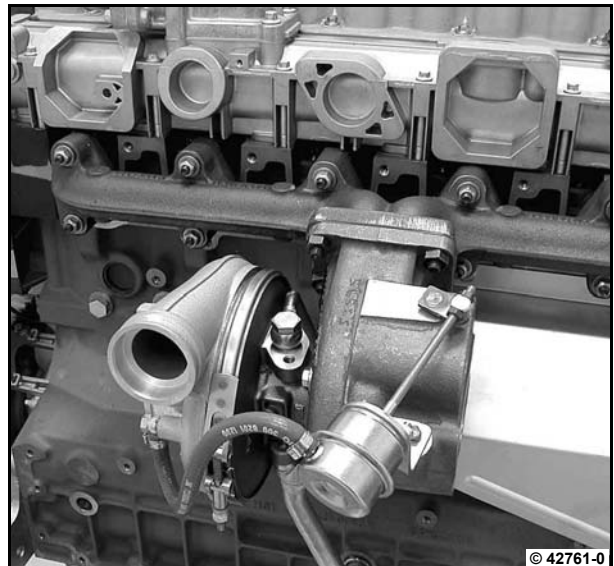
6

Removing exhaust manifold

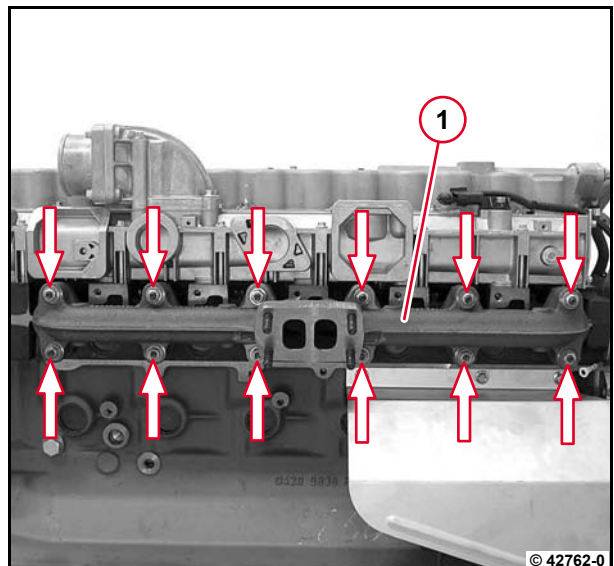
- Remove the turbocharger.



W 06-06-04



- Unscrew nuts (arrows), remove exhaust manifold (1) and gaskets.
- Visually inspect the components.



Installing exhaust manifold

- Clean the sealing surfaces on the exhaust manifold and cylinder head.
- Mount exhaust manifold with new gaskets and screw on new nuts.

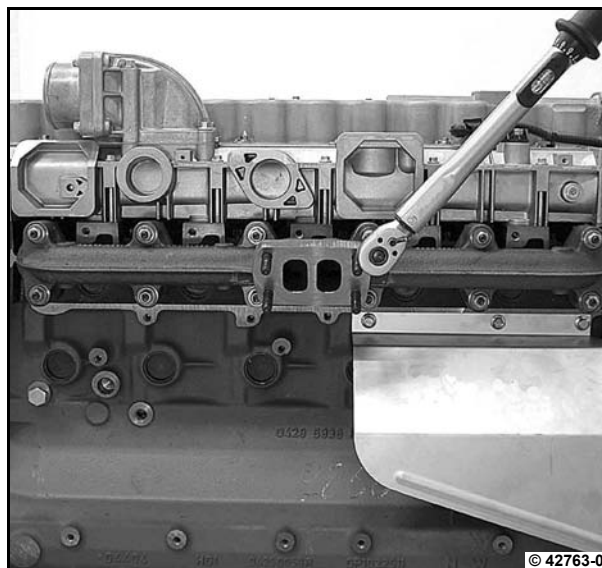


Coat the pin bolts with fitting compound .

- Tighten the nuts alternately from the centre outwards.



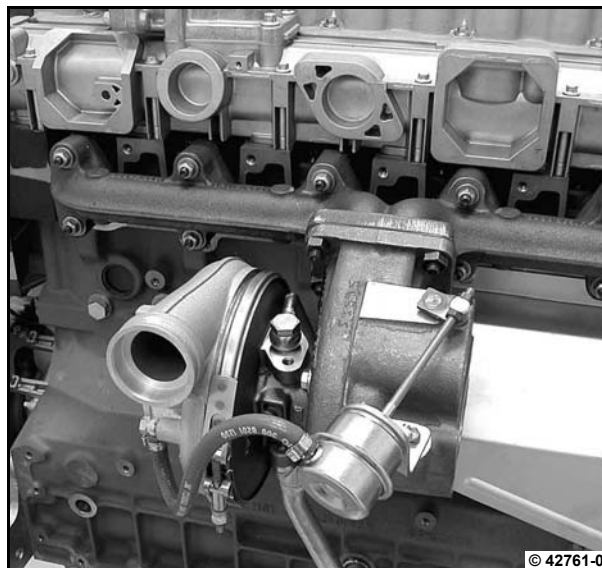
A06 001



- Install turbocharger.



W 06-06-04



Remove and install turbocharger



Commercial available tools



– Assembly aid DEUTZ S1

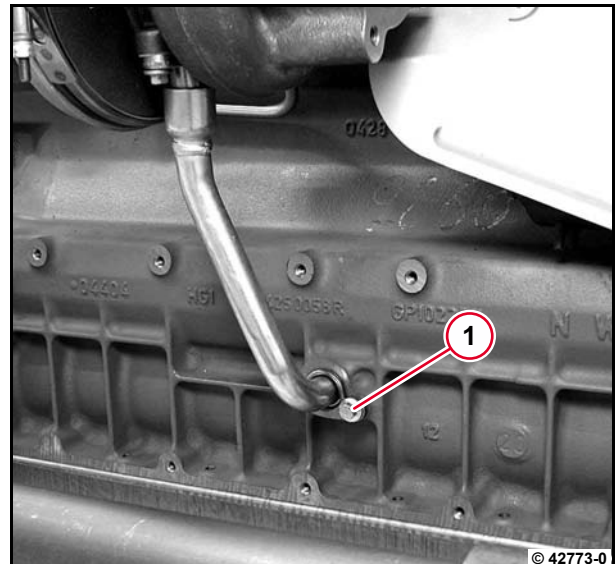


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

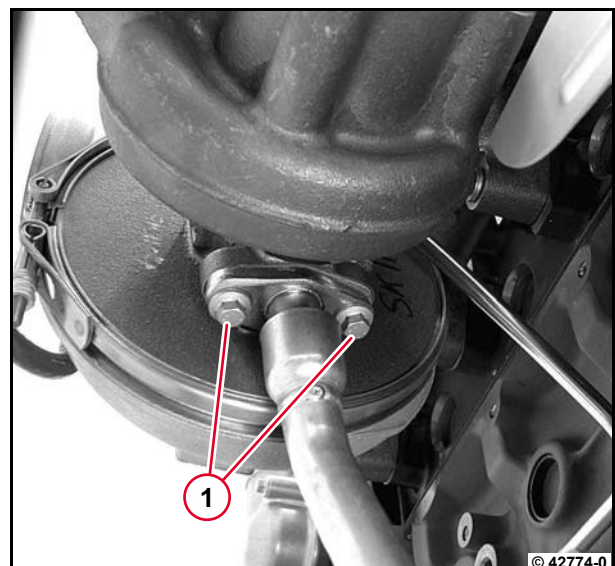
6

Removing turbocharger

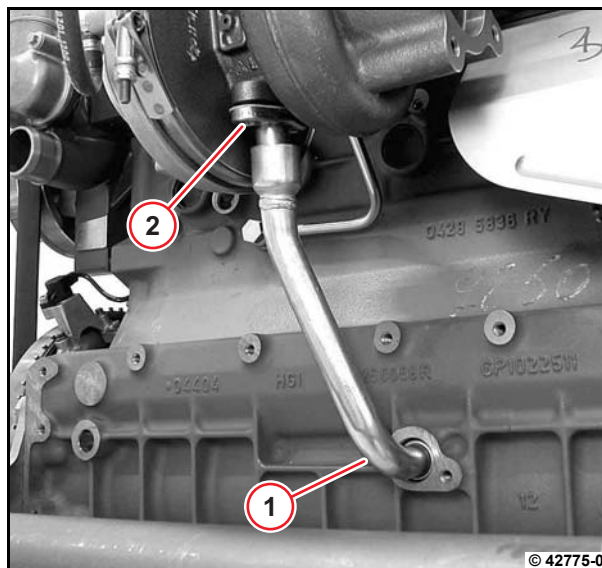
- Unscrew screws (1) and remove holder.



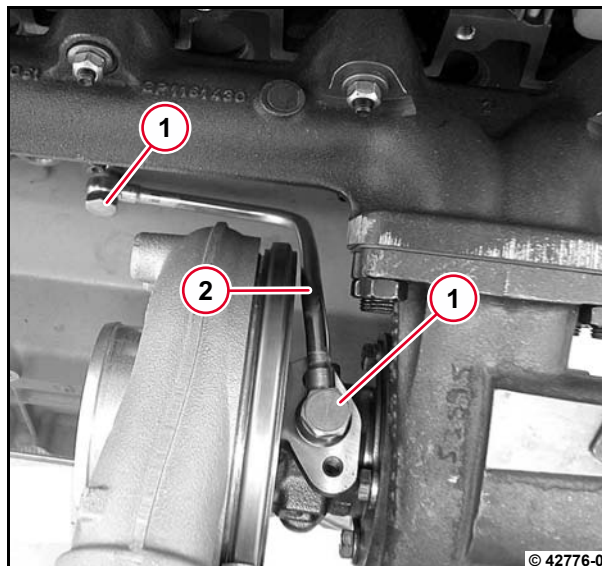
- Unscrew screws (1).



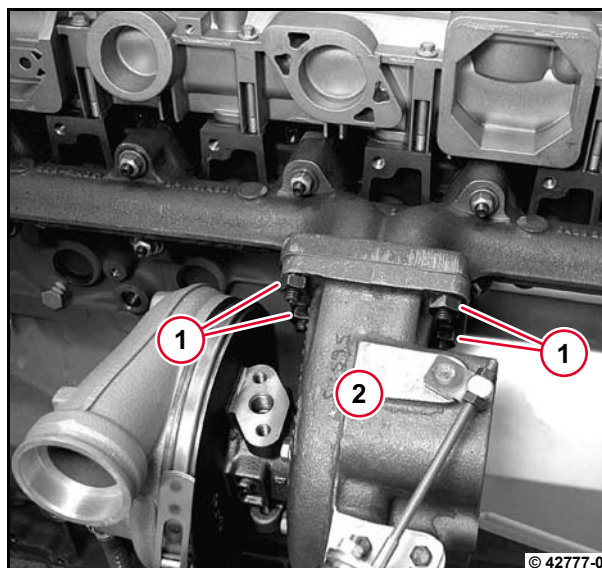
- Pull the oil return line (1) out of the crankcase and remove with pipe socket (2).



- Unscrew hollow screw (1), remove lube oil line (2) and sealing rings.



- Unscrew nuts (1), remove turbocharger (2) and gasket.
- Visually inspect the components.



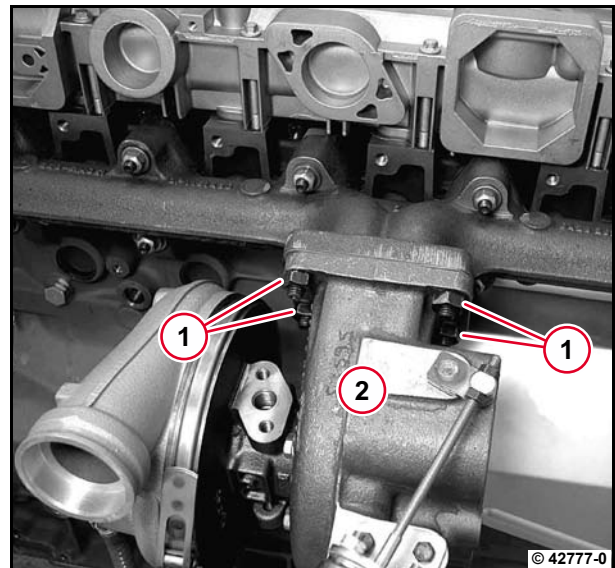
Installing the turbocharger

- Clean the sealing surface on the turbocharger and exhaust manifold.
- Fit turbocharger (2) with new gasket and tighten the nuts (1).

 A06 020



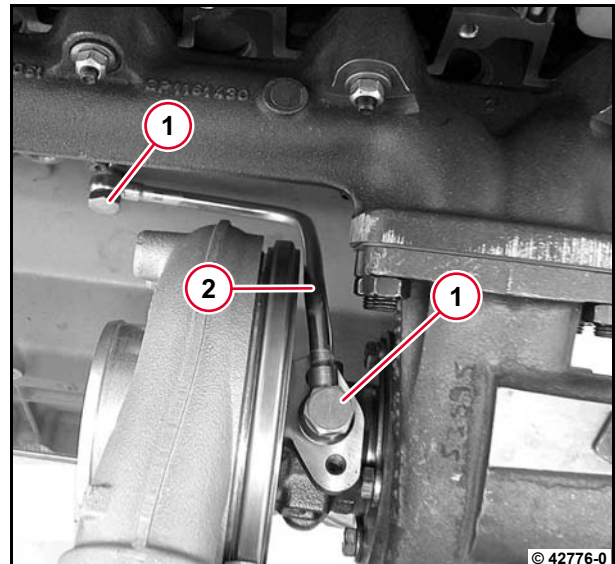
Coat the studs with assembly aid.



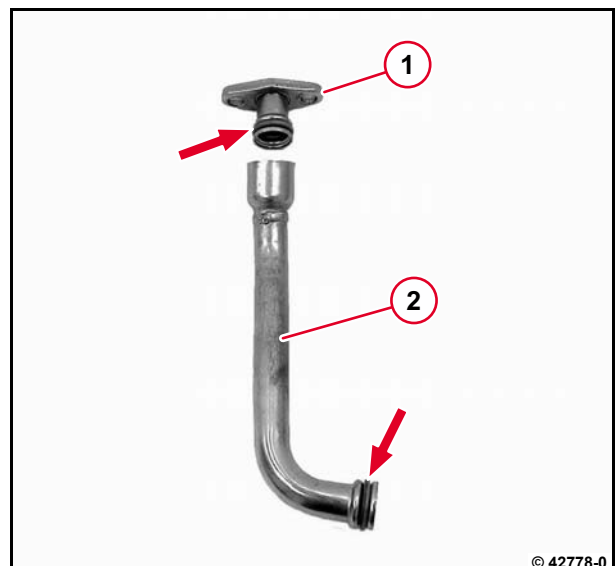
6

- Install the lube oil line (2), tighten hollow screws (1) with new sealing rings.

 A08 040

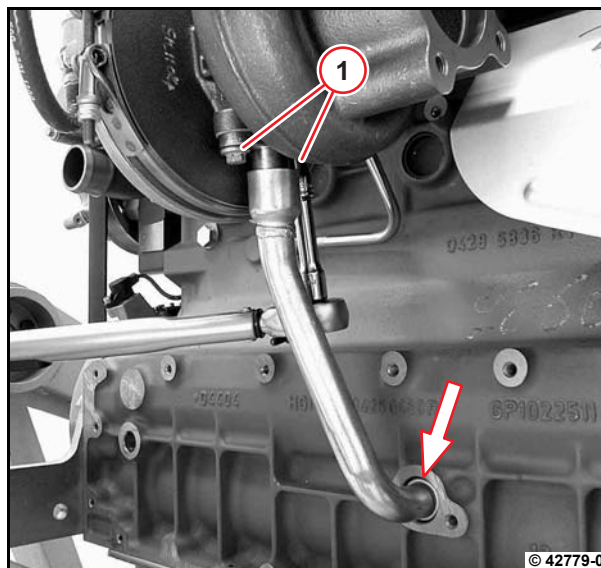


- Pull pipe socket (1) out of oil return line (2).
- Pull new round sealing rings (arrows) onto pipe socket and oil return line.
- Oil round sealing rings lightly.
- Push pipe sockets into oil return line.



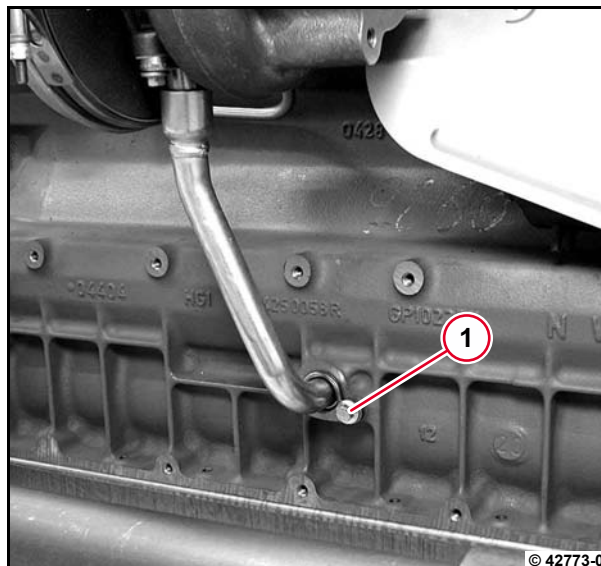
- Clean the sealing surface on the turbocharger and pipe socket.
- Push the oil return line into the crankcase (arrow).
- Fit pipe socket with new gasket and tighten the screws (1).

 A08 044



- Mount holder and tighten screw (1).

 A08 044



Remove and install charge air line



Commercial available tools

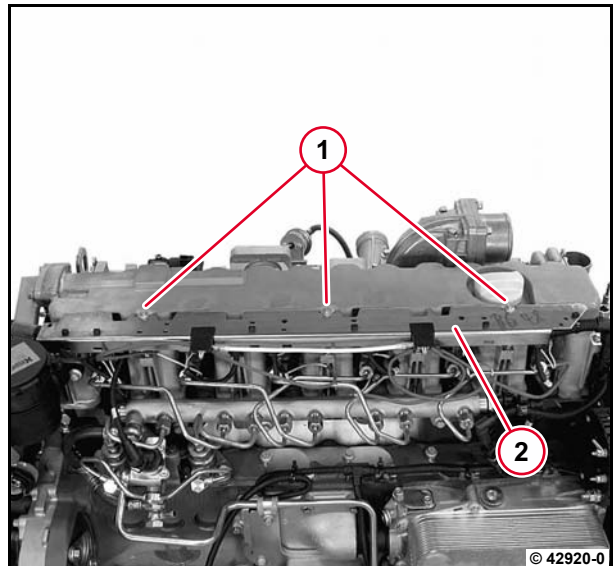


– W 13-08-01

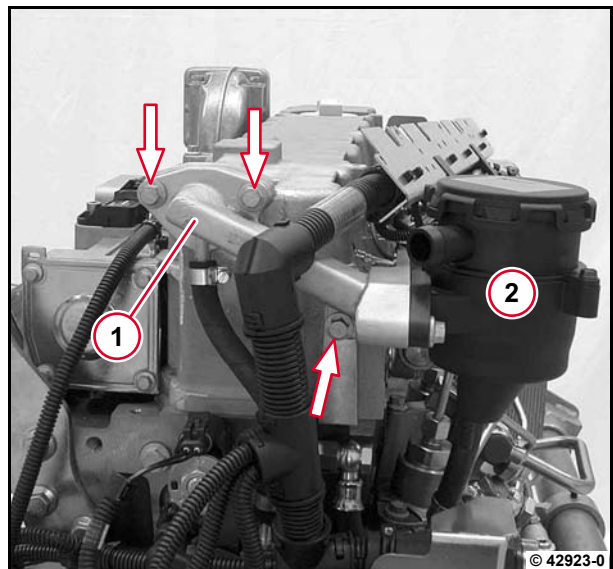
6

Removing the charge air line

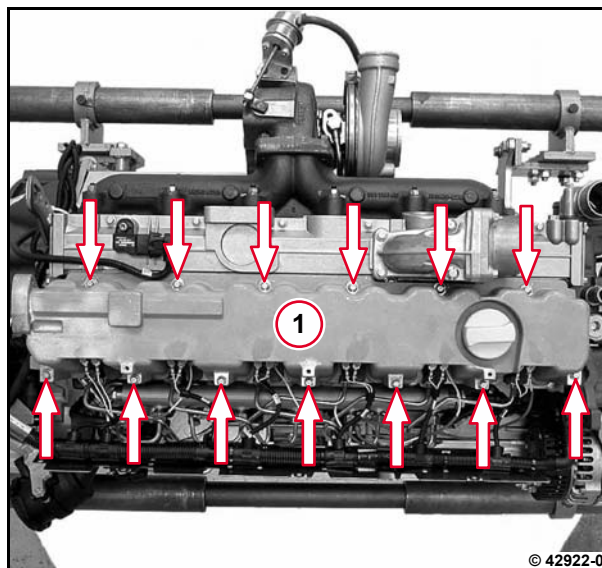
- Unscrew screws (1) and remove cover plate (2).



- Unscrew screws (arrows), remove ventilation duct (1) with crankcase venting (2) and hang to one side.



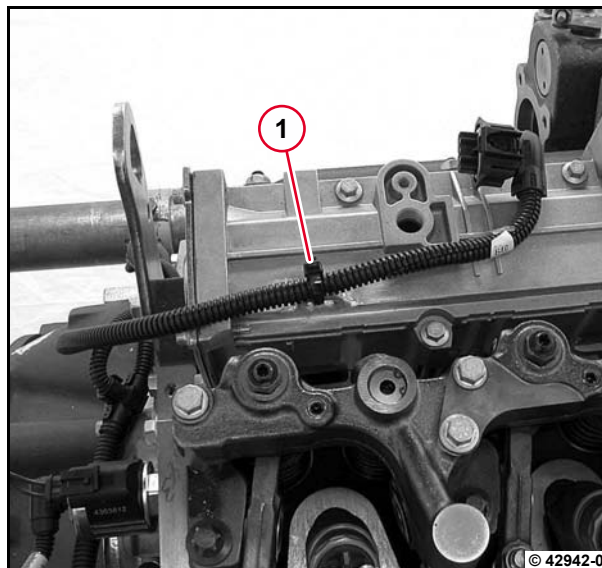
- Unscrew screws (arrows), remove cylinder head cover (1) and gasket.



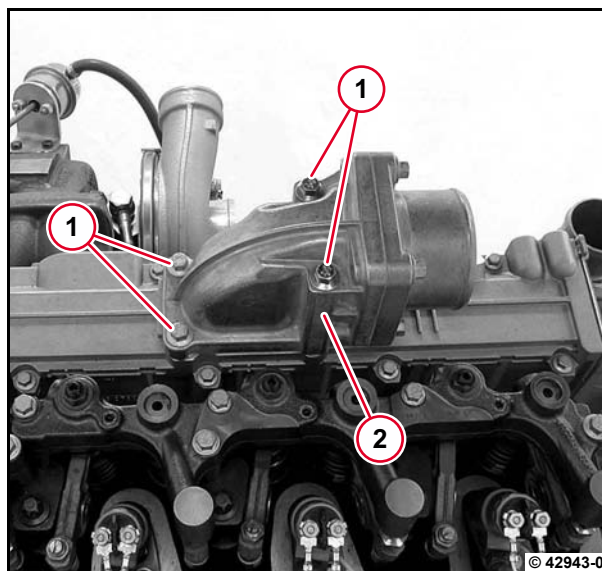
- Remove pressure/temperature sensor.

 [W 13-08-01](#)

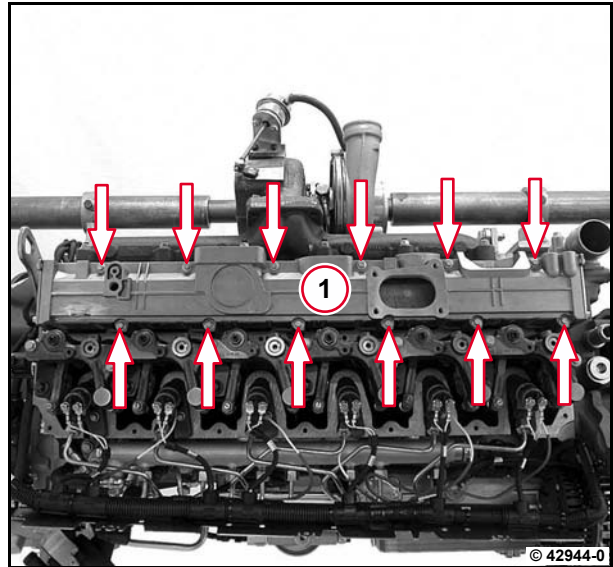
-
- Remove cable tie (1) and free cable.



- Unscrew screws (1), remove charge air manifold (2) and gasket.



- Unscrew screws (arrows), remove charge air line (1) and gaskets.
- Visually inspect the components.



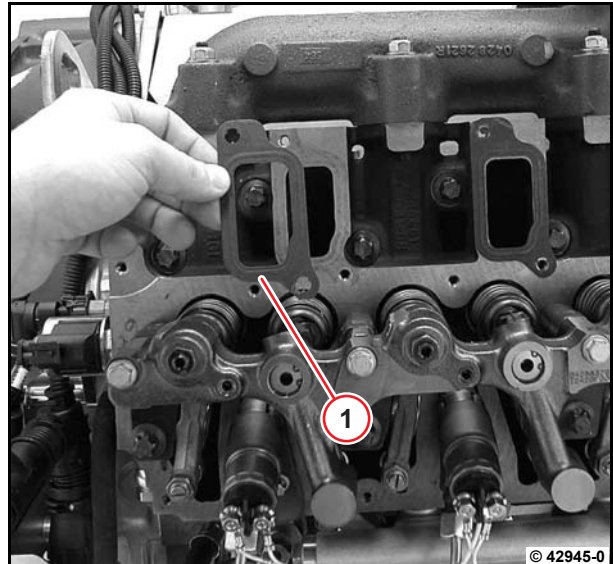
6

Install charge air line

- Clean the sealing surface on the charge air line and cylinder head.
- Mount new gaskets (1).



Note installation position of the gaskets.



- Mount the charge air line and tighten the screws.

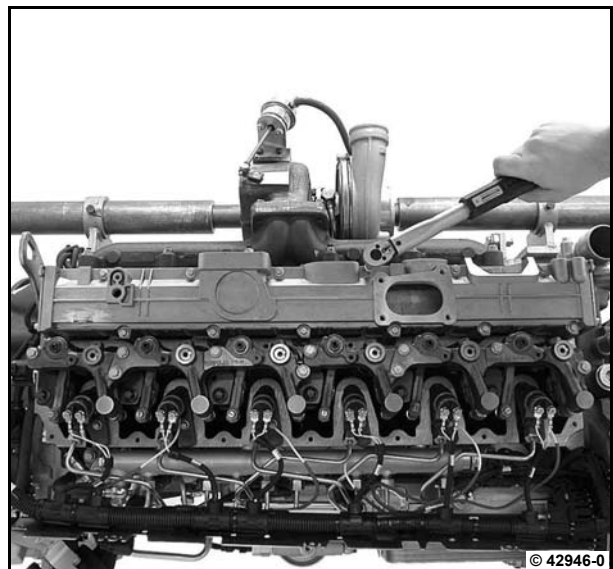


Do not move the gaskets when mounting the charge air line.

- Tighten the screws alternately from the centre outwards.



A06 030



- Clean the sealing surface on the charge air manifold and charge air line.
- Mount charge air manifold with new gasket and tighten screws.



Note the different screw lengths:

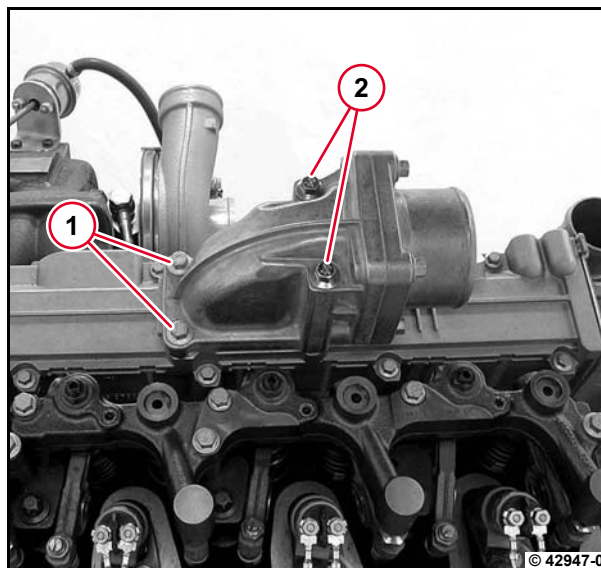
Screw M8 x 30 mm (1)

Screw M8 x 95 mm (2)

- Tighten screws.



A06 046

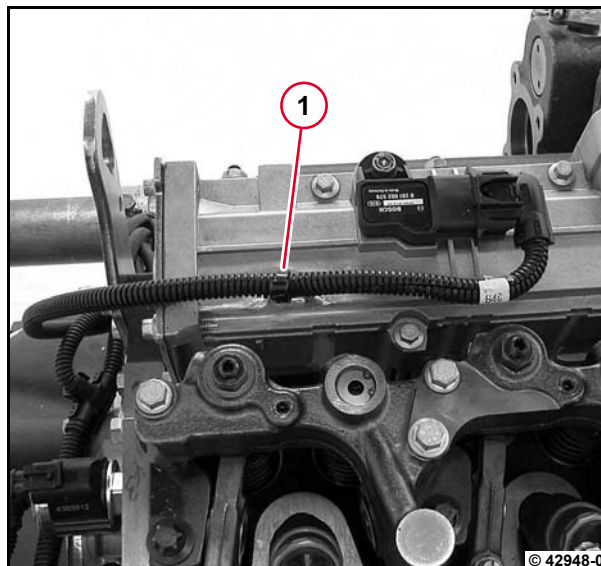


- Install pressure/temperature sensor.

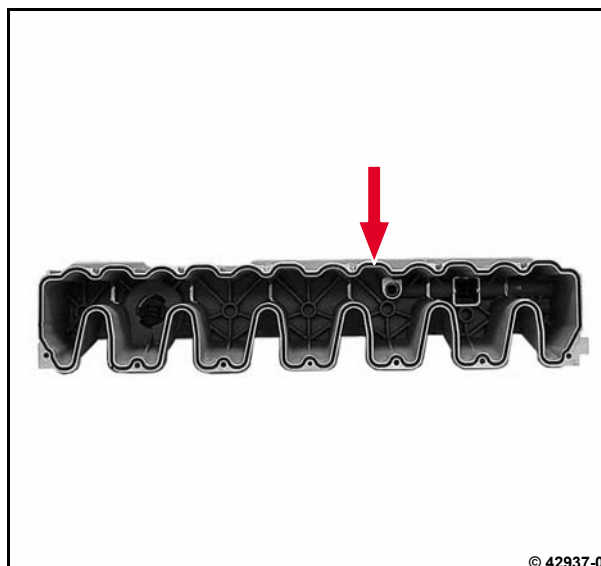


W 13-08-01

-
- Fix cable with cable tie (1).



- Clean the sealing surface on the cylinder head cover and cylinder head.
- Insert new gasket (arrow).



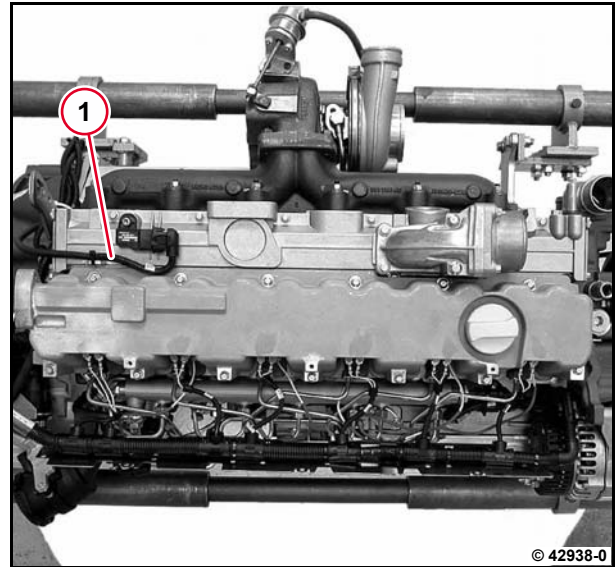
- Mount cylinder head cover and tighten screws alternately.

 A01 004



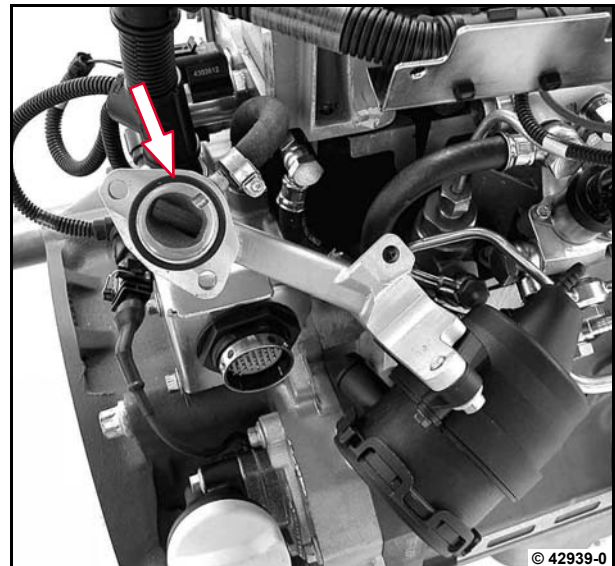
Attention!

Do not trap the cable (1) when mounting the cylinder head cover.



6

- Clean the sealing surface on the ventilation duct and cylinder head cover.
- Insert new gasket (arrow).



- Mount ventilation duct with crankcase venting and tighten screws.



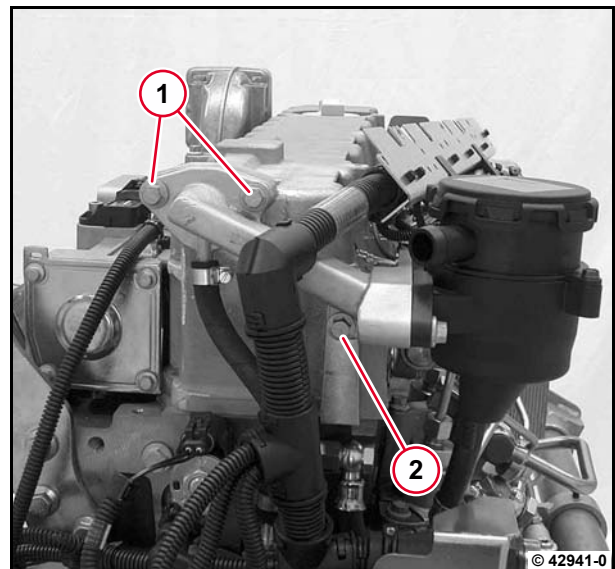
Note the different screw lengths:

Screw M8 x 25 mm (1)

Screw M8 x 20 mm (2)

- Tighten screws.

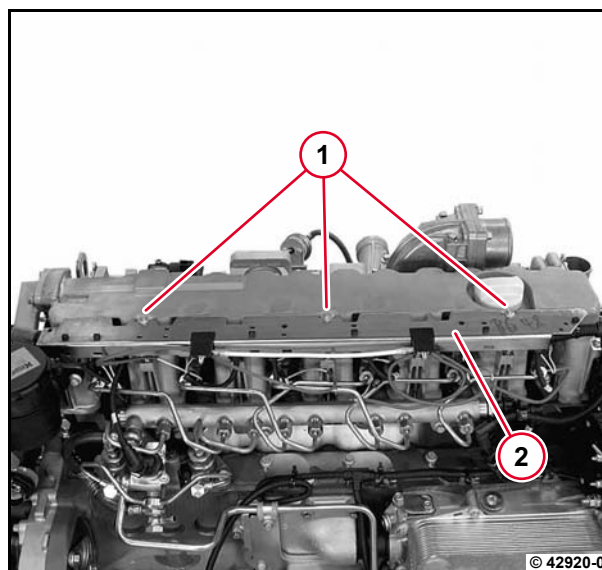
 A03 060



- Mount cover plate (2) and tighten screws (1).



A13 041



Removing and installing the exhaust return module



Commercial available tools

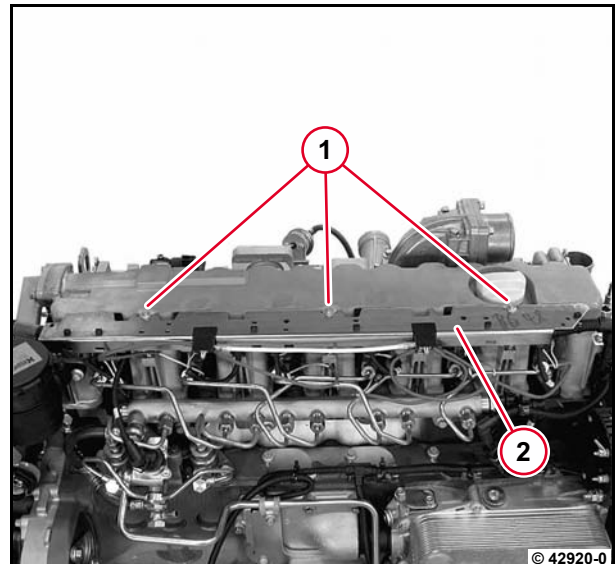


– W 01-01-01

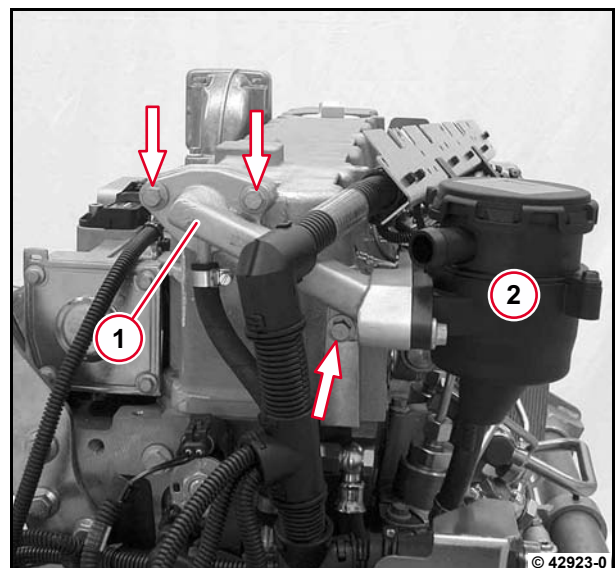
6

Removing the exhaust return module

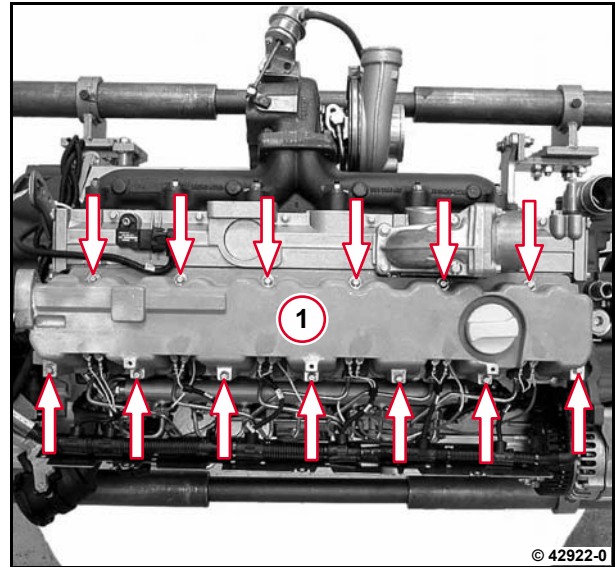
- Unscrew screws (1) and remove cover plate (2).



- Unscrew screws (arrows), remove ventilation duct (1) with crankcase venting (2) and hang to one side.



- Unscrew screws (arrows), remove cylinder head cover (1) and gasket.

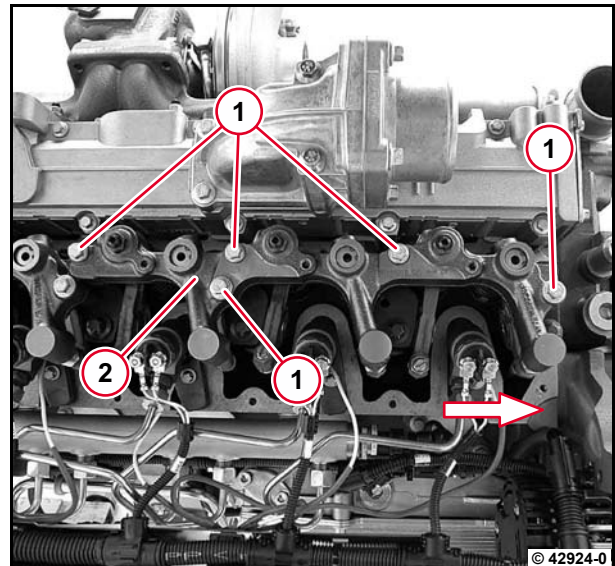


- Unscrew screws (1).



Loosen screws evenly to avoid jamming the exhaust return module.

- Pull the exhaust return module (2) off the plug element in the direction of the arrow and remove.

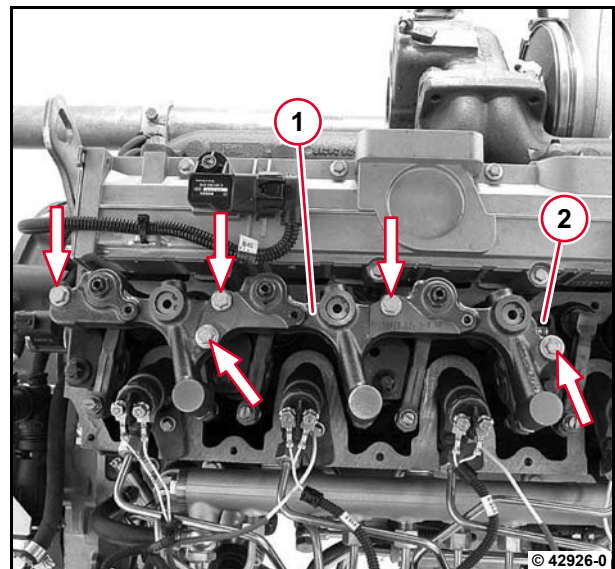


- Unscrew the screws (arrows) and remove the exhaust return module (1) with plug element (2).



Loosen screws evenly to avoid jamming the exhaust return module.

- Visually inspect the components.

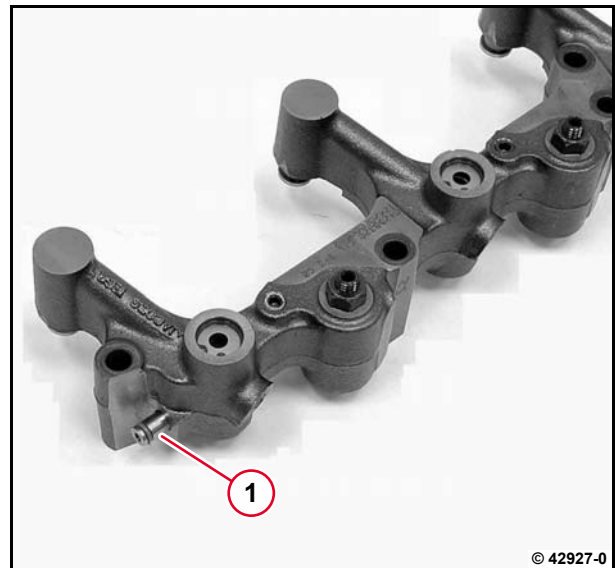


Installing the exhaust return module

- Set valve clearance (without or with removing exhaust return module).

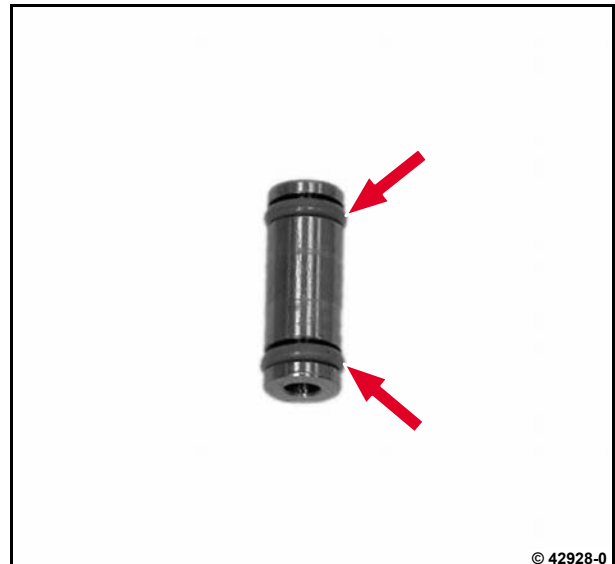
 W 01-01-01

- Pull out plug element (1).



6

- Pull O-rings (arrows) onto plug element.
- Lightly oil O-rings and attach plug element to exhaust return module.



- Mount exhaust return module for cylinders 1 - 3 and fasten screws.

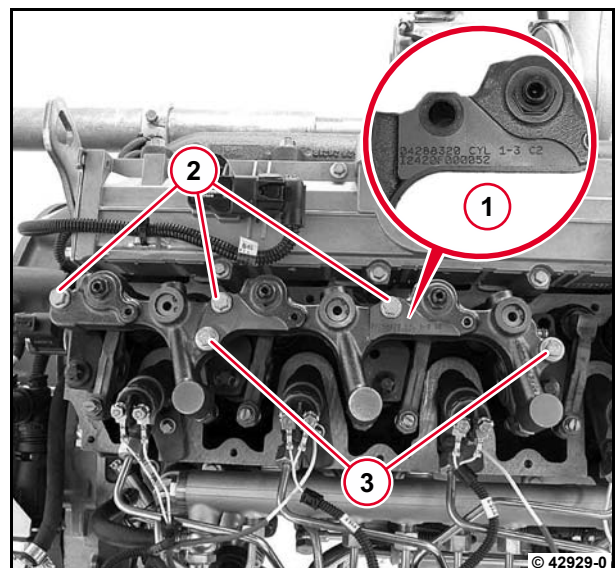


Note the labelling (1) for assigning the exhaust return modules.

Note the different screw lengths:

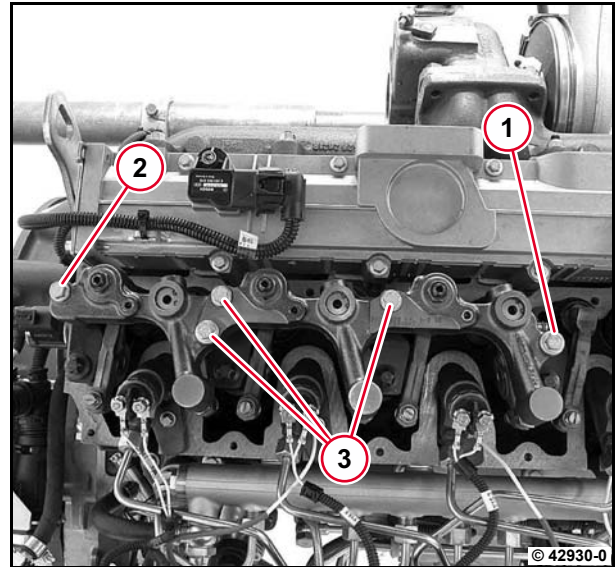
Screws M8 x 104 mm (2)

Screws M8 x 60 mm (3)



- Tighten the screws in the tightening sequence (1, 2 and 3).

 A01 002



- Push exhaust return module for cylinders 4 - 6 onto plug element and fasten screws.

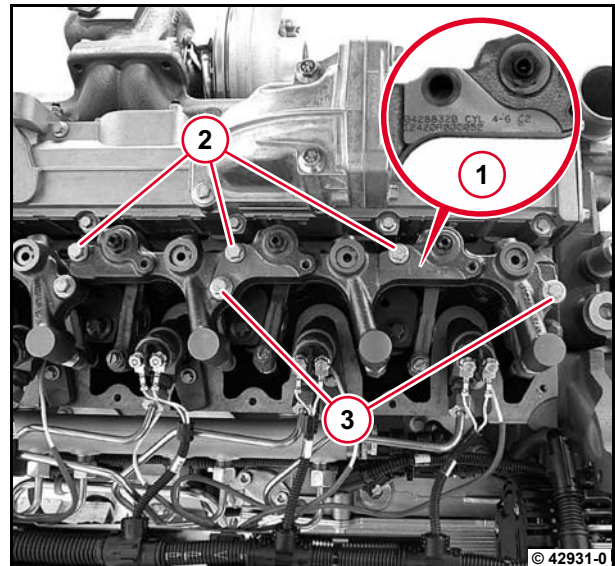


Note the labelling (1) for assigning the exhaust return modules.

Note the different screw lengths:

Screws M8 x 104 mm (2)

Screws M8 x 60 mm (3)

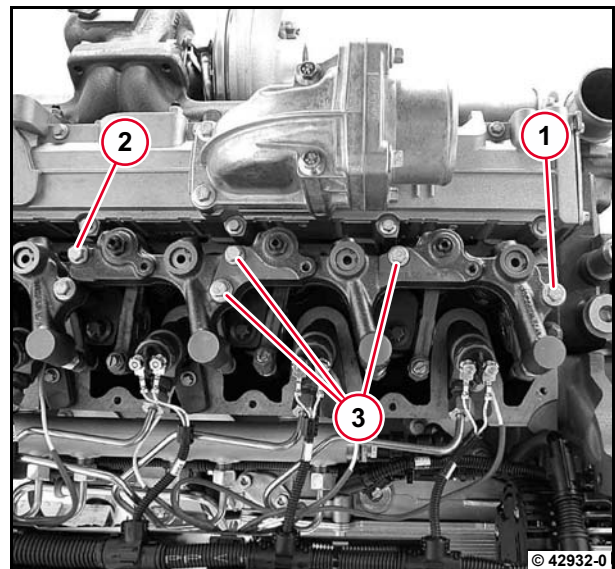


- Tighten the screws in tightening sequence (1, 2 and 3).

 A01 002

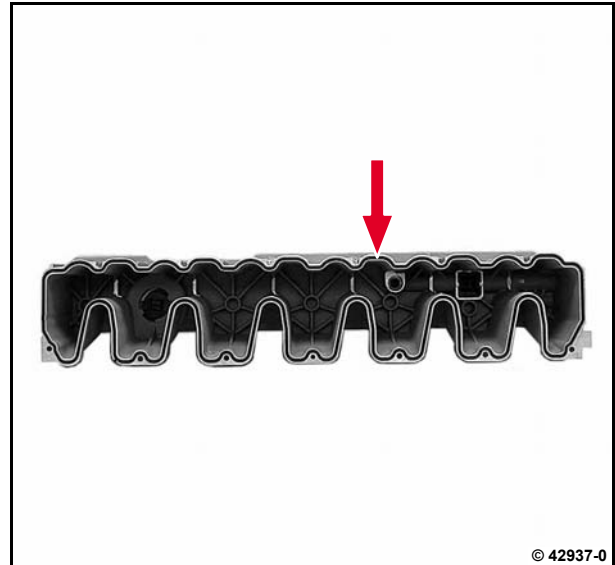
- Set control piston clearance.

 W 01-01-01



Assembly

- Clean the sealing surface on the cylinder head cover and cylinder head.
- Insert new gasket (arrow).



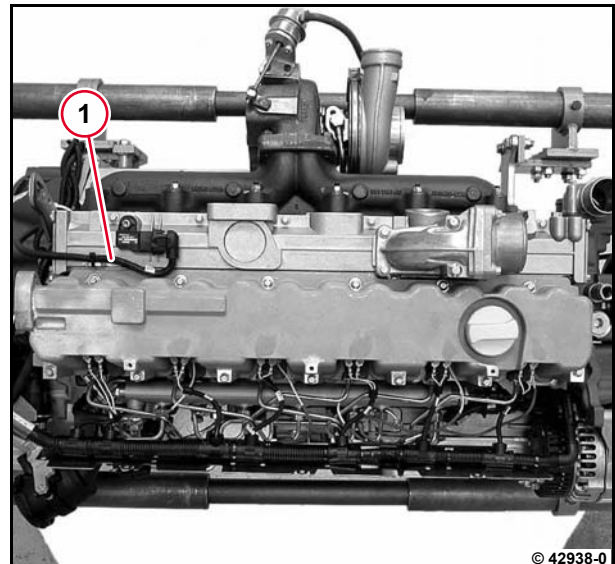
- Mount cylinder head cover and tighten screws alternately.

 A01 004

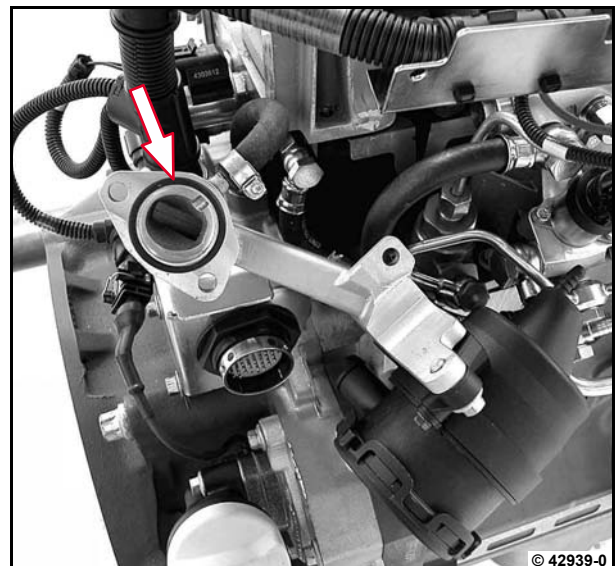


Attention!

Do not trap the cable (1) when mounting the cylinder head cover.



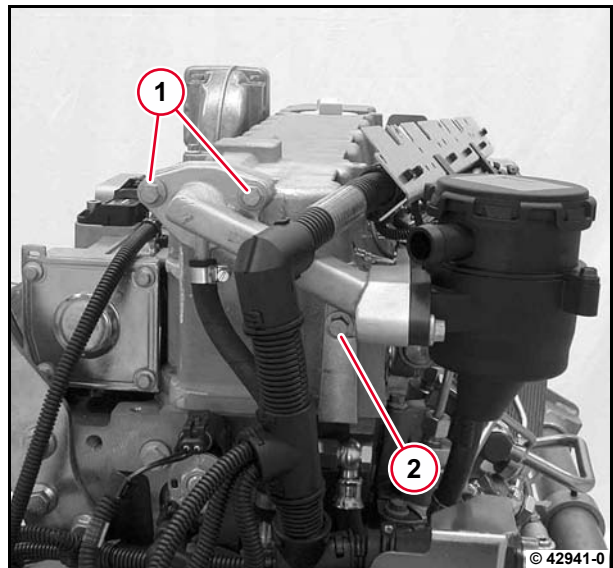
- Clean the sealing surface on the ventilation duct and cylinder head cover.
- Insert new gasket (arrow).



- Mount ventilation duct with crankcase venting and tighten screws.



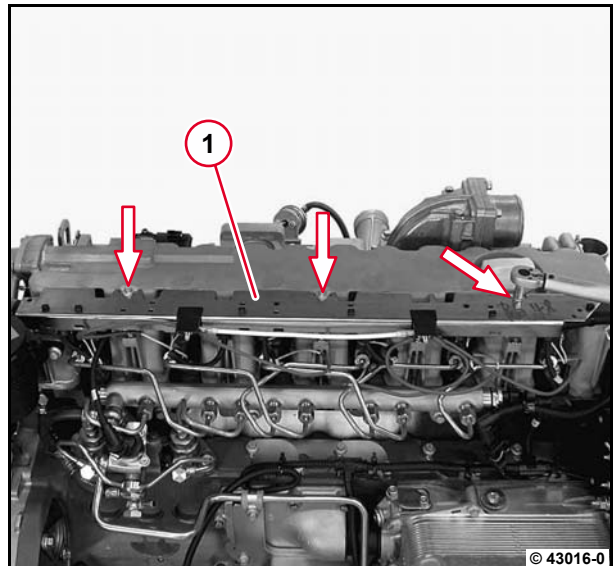
Note the different screw lengths:
Screw M8 x 25 mm (1)
Screw M8 x 20 mm (2)



- Mount the cover plate (1) and tighten the screws (arrows).



A13 041



Removing and installing the solenoid valve (exhaust return line)



Commercial available tools



– W 09-12-01



Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

6

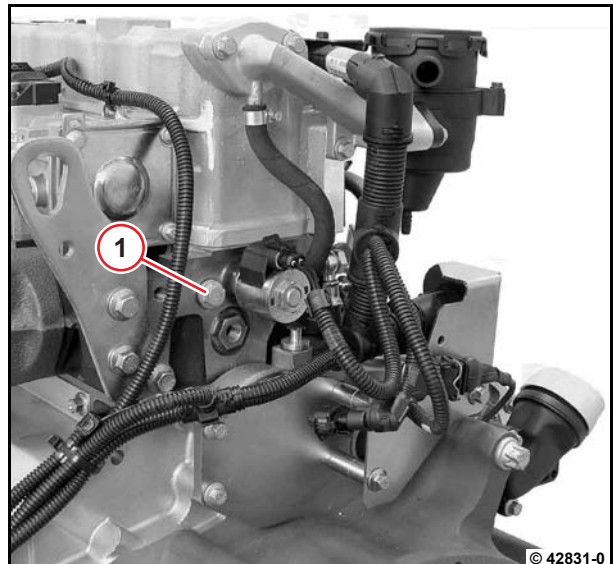
Removing the solenoid valve (exhaust return line)

- Remove the coolant temperature sensor.

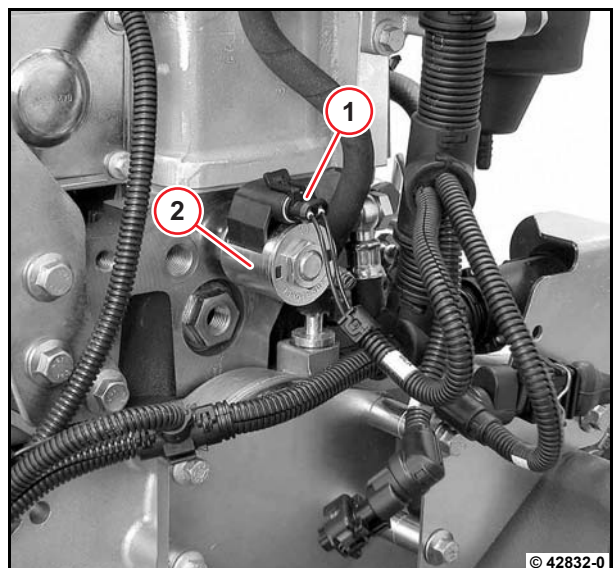


W 09-12-01

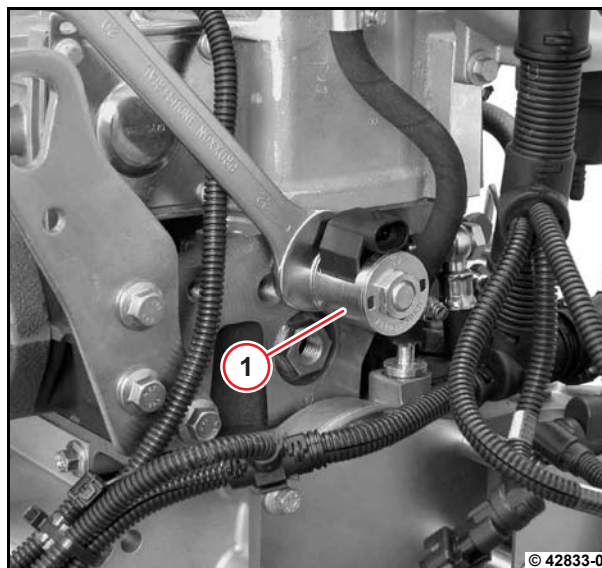
- Unscrew locking screw (1).



- Unlock cable plug (1) and remove from solenoid valve (exhaust gas return line) (2).



- Unscrew solenoid valve (exhaust return line) (1).
- Visually inspect the components.



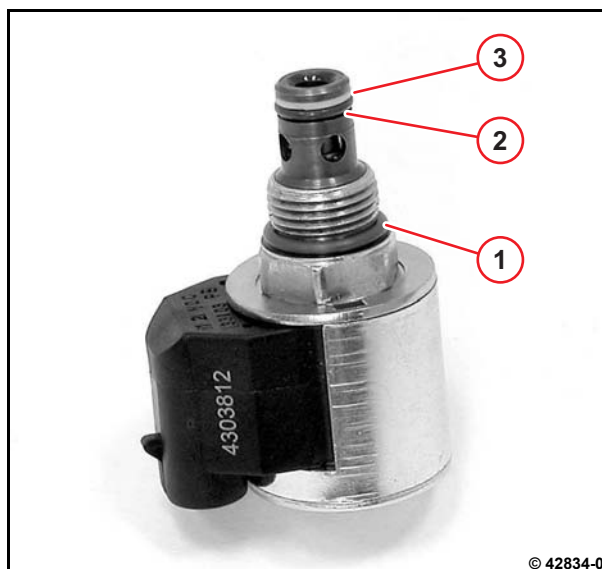
Installing the solenoid valve (exhaust return line)

- Clean the sealing surface on the solenoid valve (exhaust return line) and cylinder head.
- Pull new O-rings (1 and 2) onto solenoid valve (exhaust return line).



Observe the order of installation of the O-ring (2) and the support ring (3).

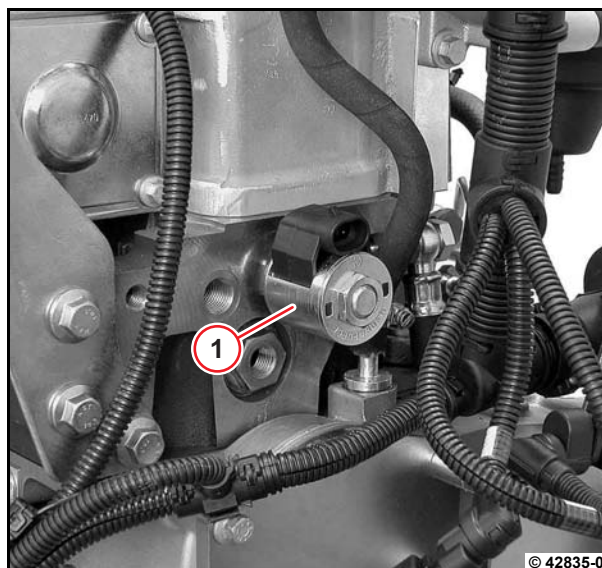
- Lightly oil both O-rings.



- Tighten solenoid valve (exhaust return line) (1).



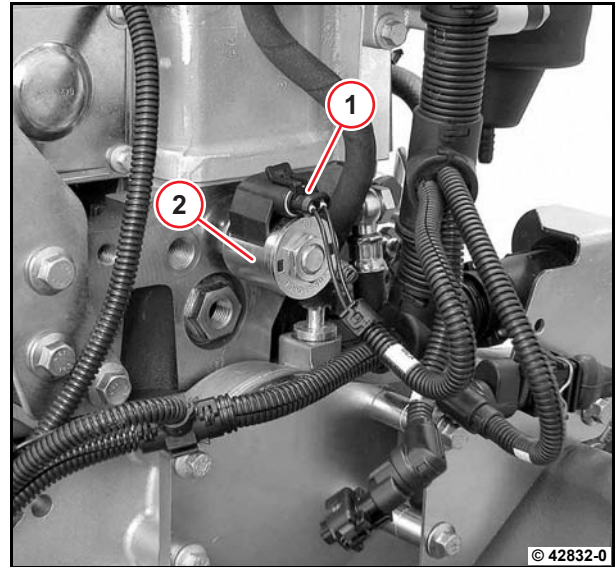
A01 013



- Plug cable plug (1) into the solenoid valve (exhaust gas return line) (2).



Ensure that the connection is perfect.



- Tighten cap (1) with new sealing ring.

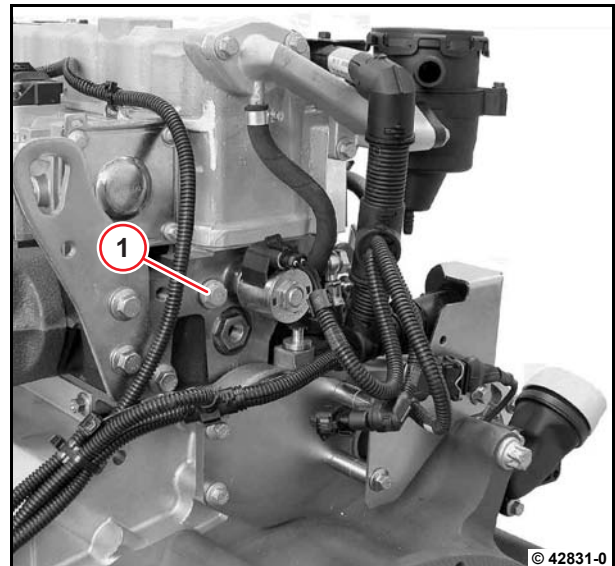


A01 016

- Install the coolant temperature sensor.



W 09-12-01



Remove and install fuel filter console



Commercial available tools:

– Torx tool set 8189

Special tools:

– Special wrench 170 050

– Stoppers/caps 170 160



– [User notes](#)

– Operating manual



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the fuel filter console



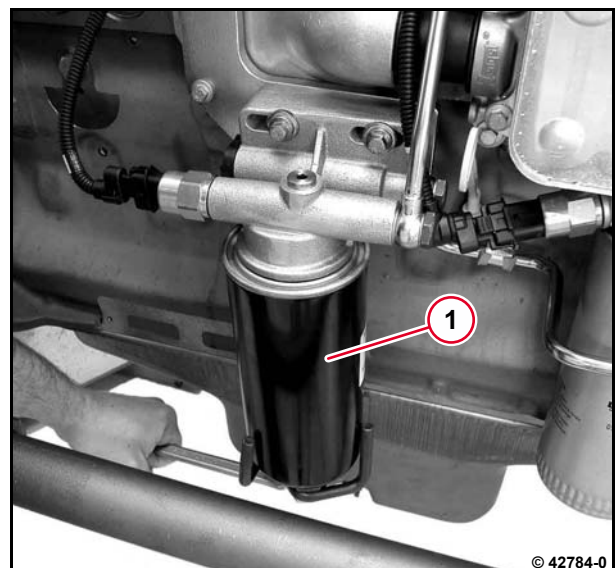
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Unscrew fuel filter (1) with special wrench.



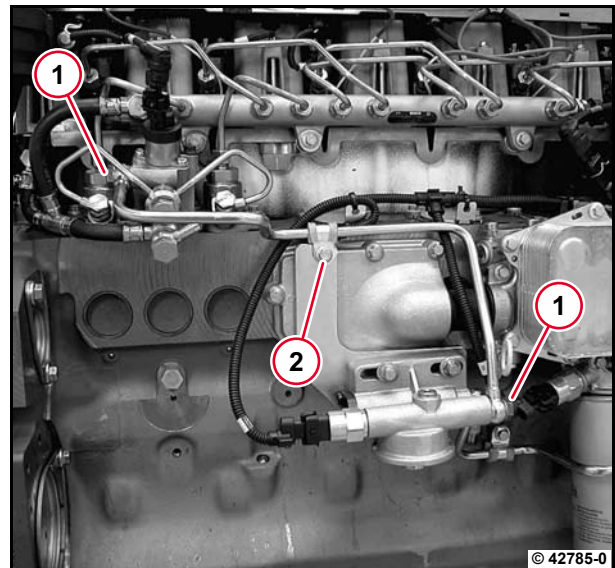
Collect draining fuel and dispose of according to regulations.



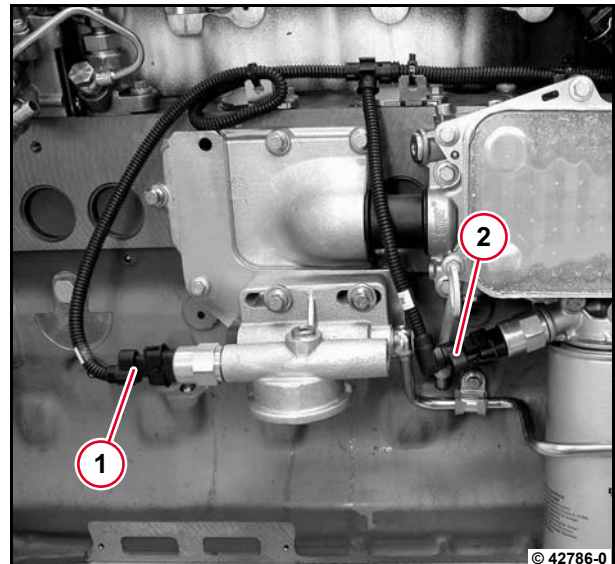
- Unscrew hollow screws (1) and remove sealing rings.
- Unscrew screws (2), loosen pipe clip and remove fuel pipe.



Collect draining fuel and dispose of according to regulations.



- Unlock cable plug (1) and remove from fuel pressure sensor.
- Unlock cable plug (2) and remove from oil pressure switch.



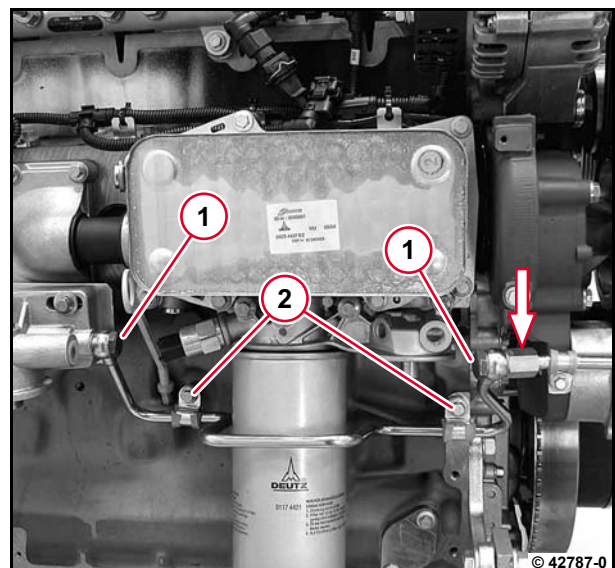
- Unscrew hollow screws (1) and remove sealing rings.



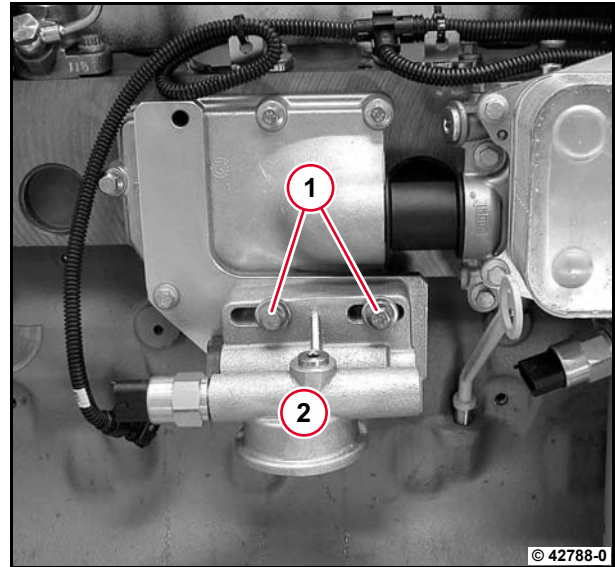
Support the fuel pipe at the hexagon (arrow).

Collect draining fuel and dispose of according to regulations.

- Unscrew screws (2), loosen pipe clips and remove fuel pipe.



- Unscrew screws (1) and remove fuel filter console (2).



6

- Visually inspect the components.

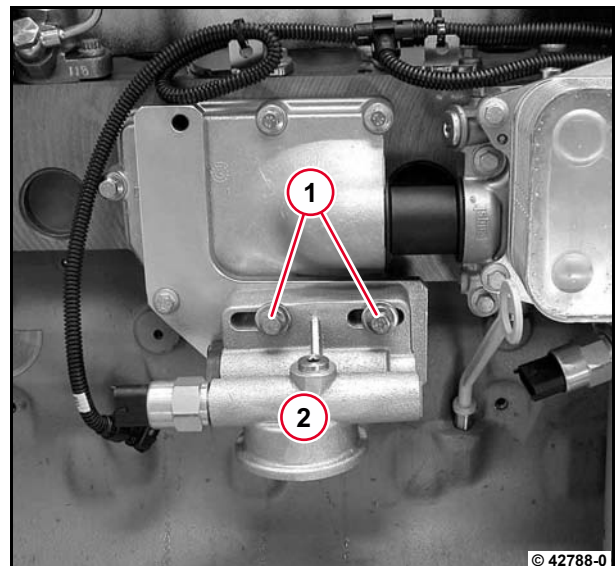


Installing the fuel filter console

- Mount fuel filter console (2) and tighten the screws (1).



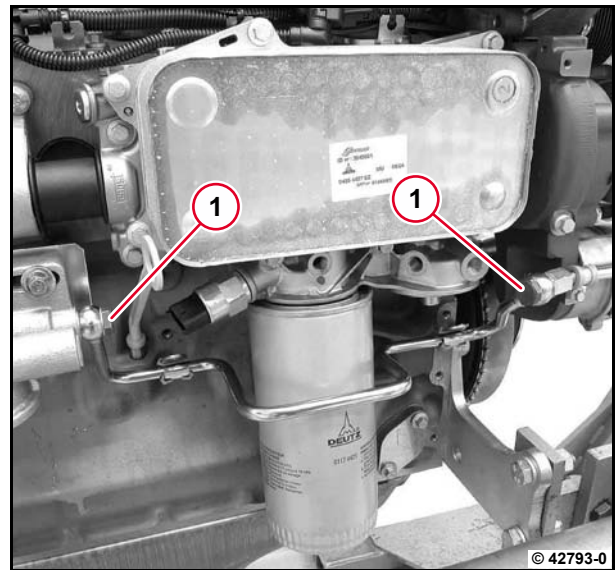
Do not tighten screws.



- Mount fuel pipe and fasten hollow screws (1) with new sealing rings.



Do not tighten hollow screws.



- Position pipe clips and tighten screws.

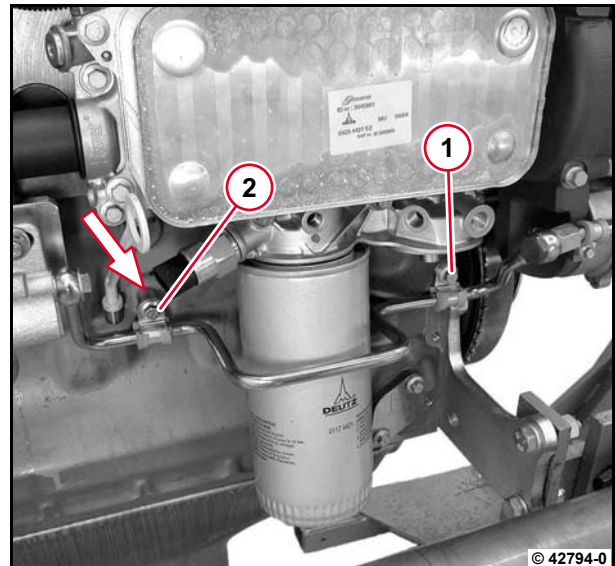
 A12 095



Note different screw lengths:

Screw M8 x 16 mm (1)

Screw M8 x 35 mm (2) with spacer sleeve (arrow)

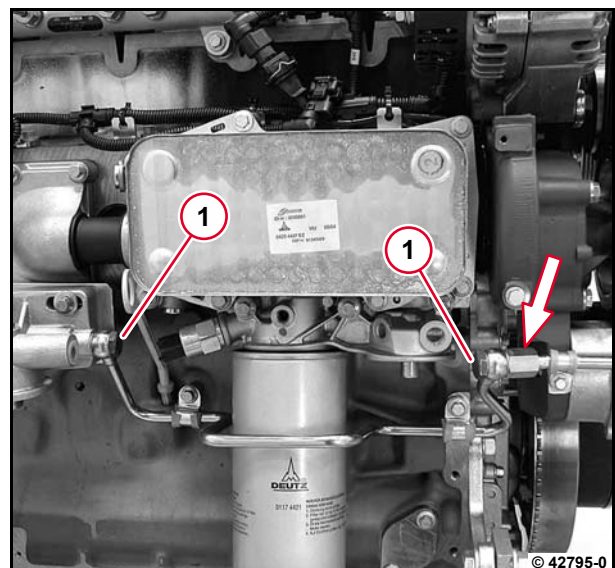


- Tighten hollow screws (1).

 A12 092



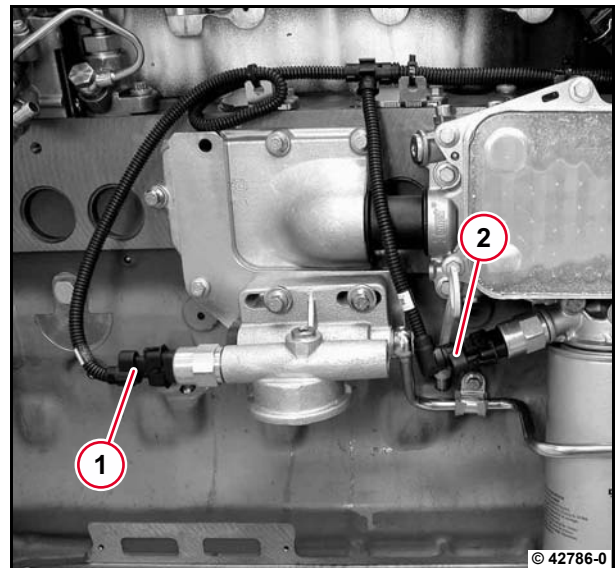
Support the fuel pipe at the hexagon (arrow).



- Plug cable plug (1) into the fuel pressure sensor.
- Plug cable plug (2) into the oil pressure switch.



Ensure that the connection is perfect.

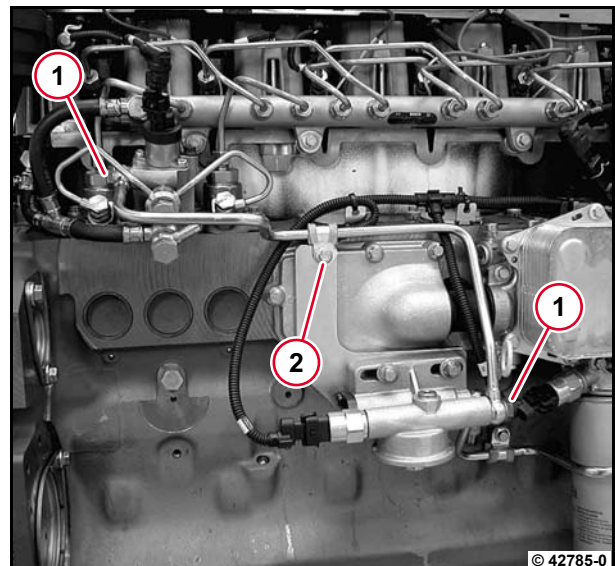


- Mount fuel pipe and fasten hollow screws (1) with new sealing rings.

 A07 045

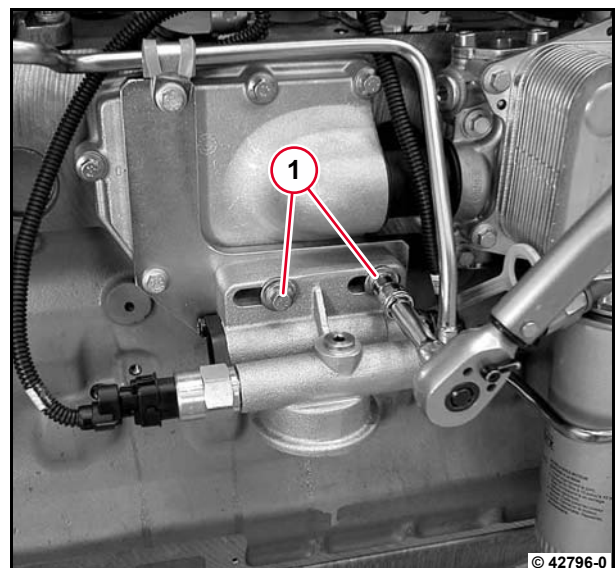
- Position pipe clips and tighten screw (2).

 A07 087



- Tighten screws (1).

 A07 087



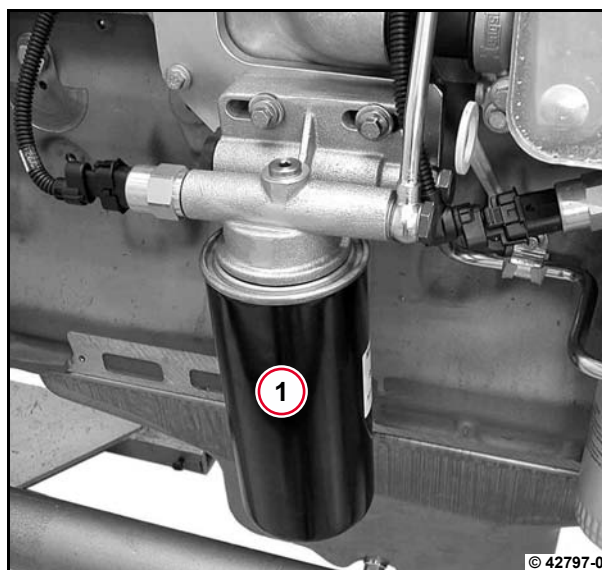
- Lightly oil sealing ring on new fuel filter.
- Screw in fuel filter (1) hand tight.



A07 099



Bleed the fuel system via the manual fuel pump on the fuel pre-filter, according to the operating instructions.



Removing and installing the fuel supply pump (V-rib belt drive)



Commercial available tools:

– Mandrel 6 mm Ø

Special tools:

– Stoppers/caps 170 160



– [User notes](#)

– Operating manual



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the respective affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

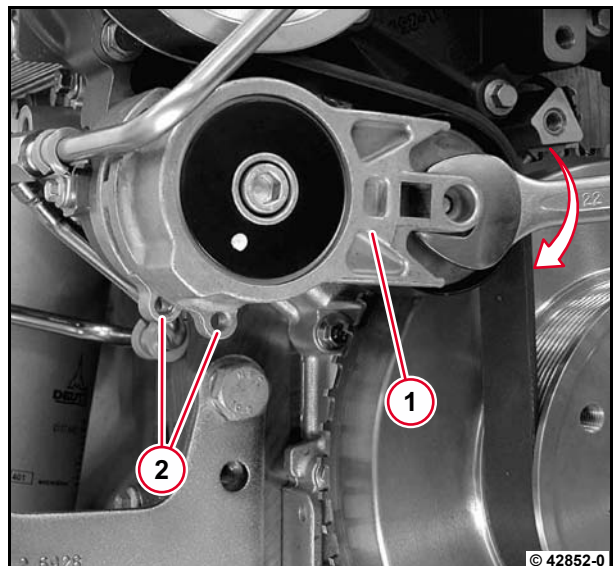
Removing the fuel supply pump



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

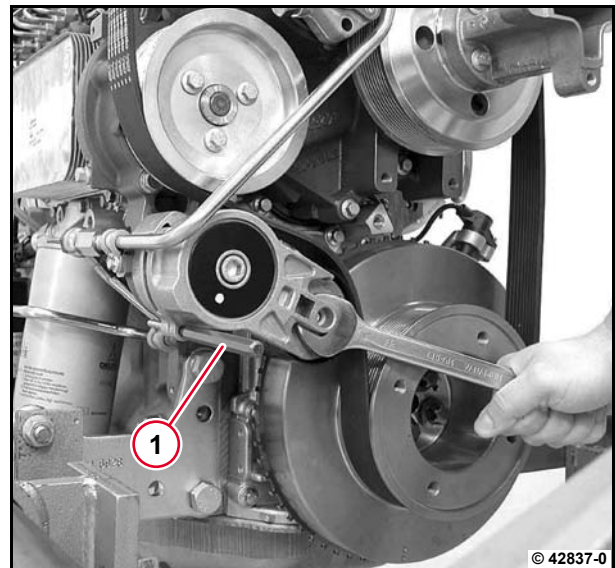
- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



- Lock the belt tensioner with a suitable tool (1), e.g. mandrel **6 mm Ø**.
- Mark the running direction of the V-rib belt.



The running direction must be marked when reusing the V-rib belt.

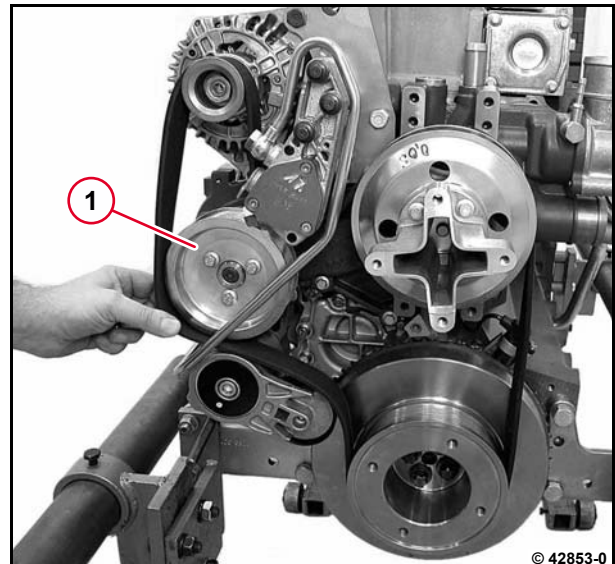


6

- Remove V-rib belt.



Remove the V-rib belt first from the V-rib belt pulley (1).

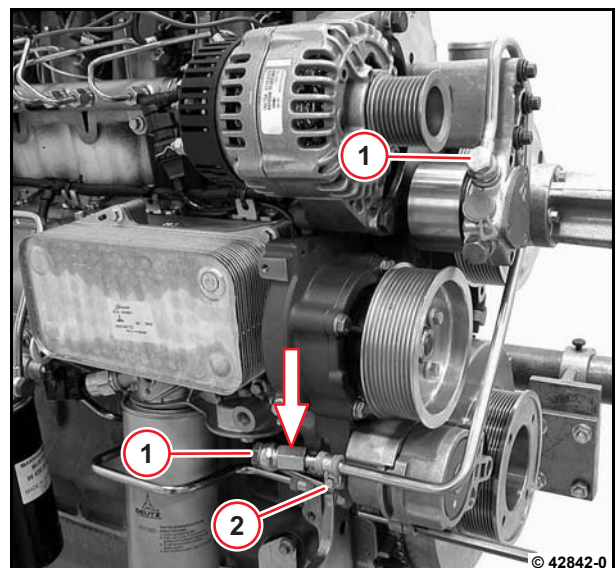


- Unscrew hollow screws (1) and remove sealing rings.

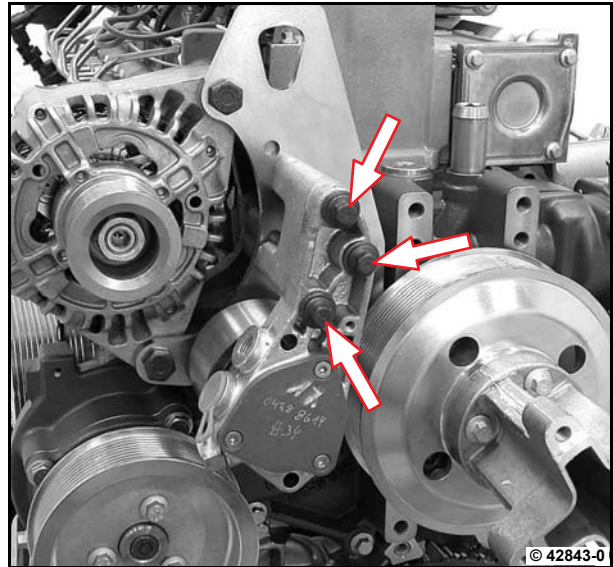


Hold the fuel pipe at the hexagon (arrow). Collect draining fuel and dispose of according to regulations.

- Unscrew screws (2), loosen pipe clip and remove fuel pipe.



- Unscrew screws (arrows) and remove fuel supply pump.
- Visually inspect the components.

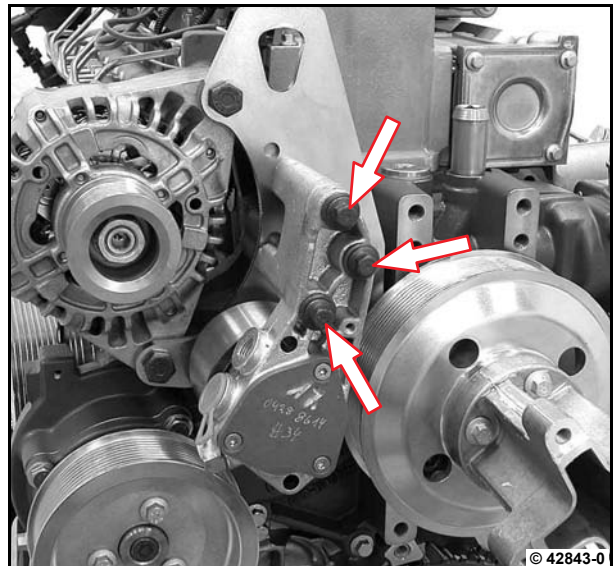


6

Installing the fuel supply pump

- Mount fuel supply pump and tighten screws (arrows).

 A07 024



- Mount fuel pipe and fasten hollow screws (1) with new sealing rings.

 A12 092

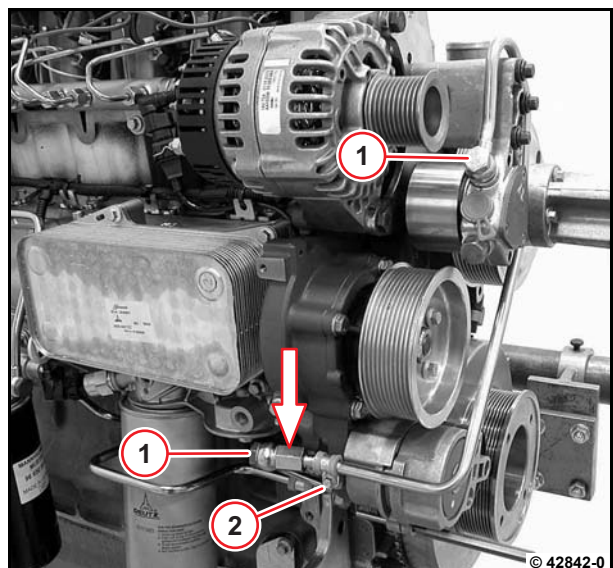


Support the fuel pipe at the hexagon (arrow).

- Position pipe clips and tighten screw (2).

 A12 095

- Bleed the fuel system according to the operating instructions via the fuel hand pump on the fuel pre-filter.

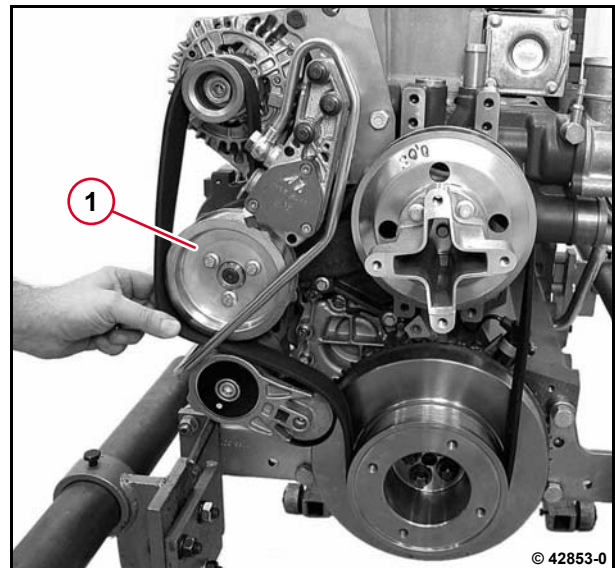


- Fit the V-rib belt according to the running direction.



Finally place the V-rib belt over the V-rib belt pulley (1).

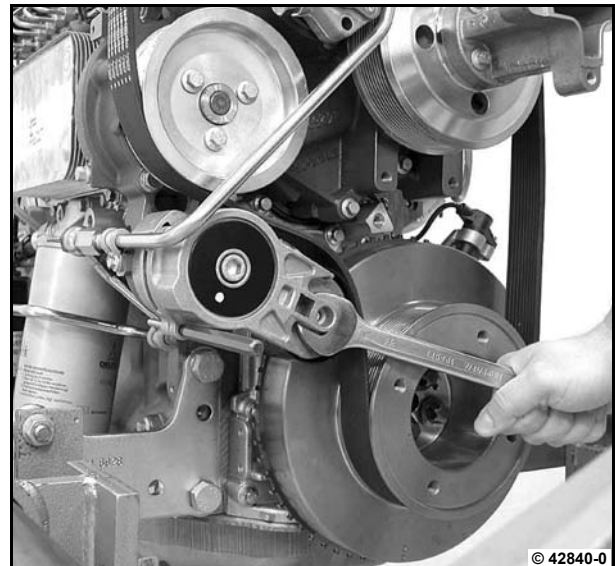
Ensure that the installation location of the V-rib belt is free from faults.



- Support the belt tensioner, remove the mandrel and slowly relieve the strain on the belt tensioner.



The V-rib belt is tightened automatically by the belt tensioner.



Checking the wear limit of the V-rib belt

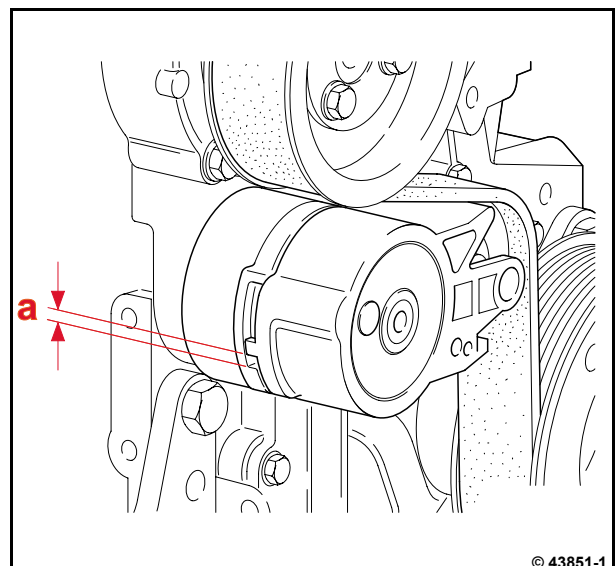


The fuel line has been removed for a better view.

- Measured distance (a).



If the distance (a) is less than 3 mm, the V-rib belt must be changed.



Removing and installing the control block

Commercial available tools

Special tools:

– Stoppers/caps 170 160

- [User notes](#)
- Operating manual
- [W 07-15-08](#)

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Bending the connecting line is not permissible. Small tears may occur which lead to a reduction in the fatigue strength.

Removing the control block

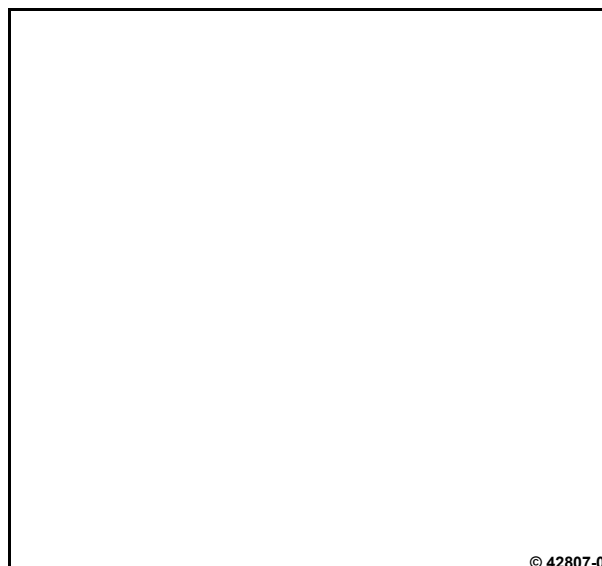
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

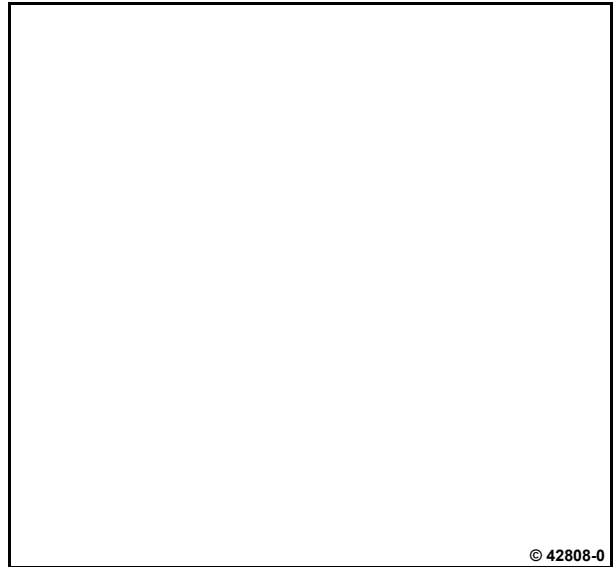
- Remove rail.

 [W 07-15-08](#)

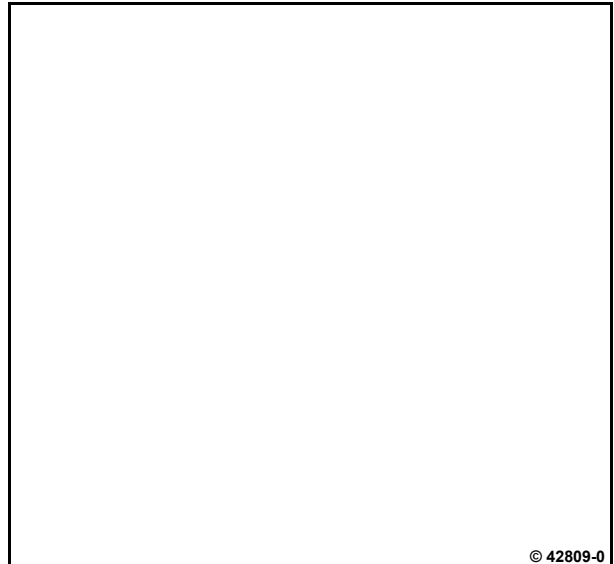
- Unlock cable plug (1) and remove.



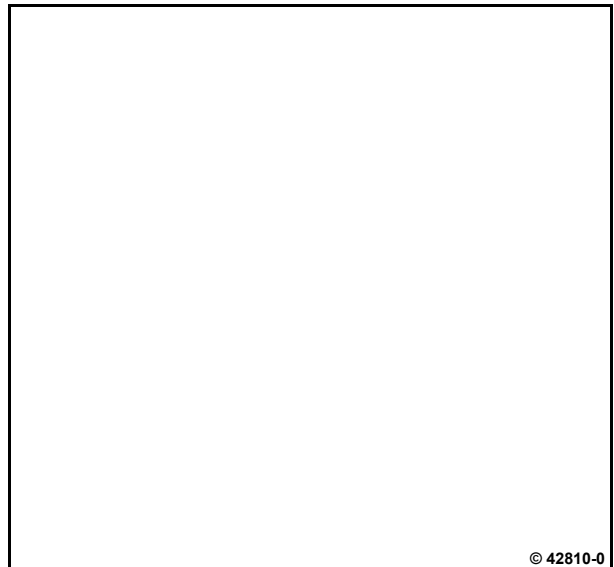
- Unscrew hollow screws (1), remove connecting line (2) and sealing rings.
Collect draining fuel and dispose of according to regulations.



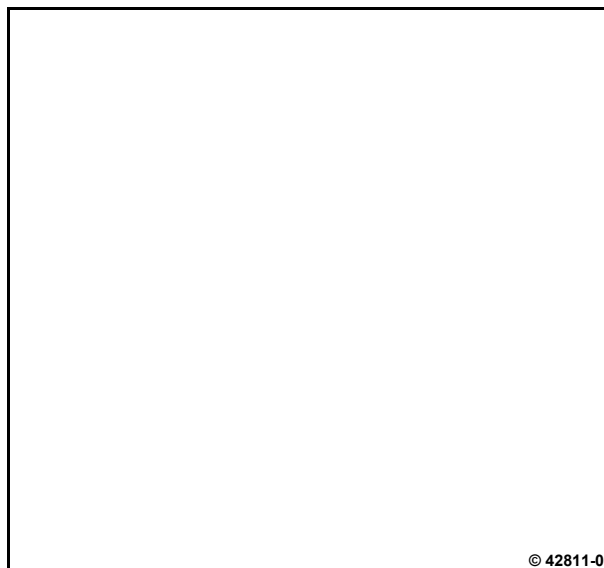
- Unscrew hollow screws (1) and remove sealing rings.
- Unscrew screws (2), loosen pipe clip and remove fuel pipe.
Collect draining fuel and dispose of according to regulations.



- Unscrew hollow screw (1), remove fuel return line (2), line connection and sealing rings.
Collect draining fuel and dispose of according to regulations.



- Unscrew screws (1) and remove control block (2).
- Visually inspect the components.



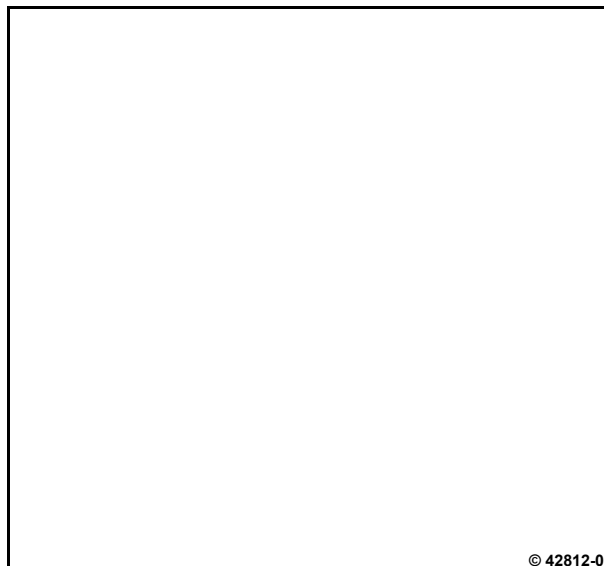
Installing the control block

- Mount the control block and pre-insert the screws loosely.

Note different screw length:

- screw M8 x 75 mm (1)
- screw M8 x 85 mm (2).

Do not tighten screws.

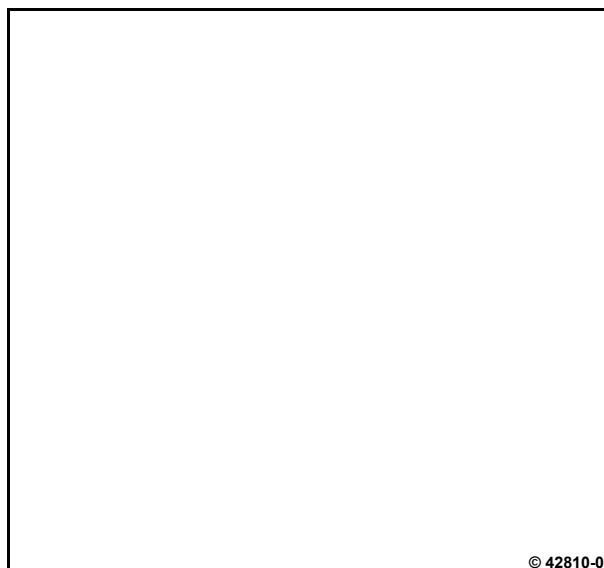


- Install the fuel return line (2) and mount line connection, tighten hollow screw (1) with new sealing rings.

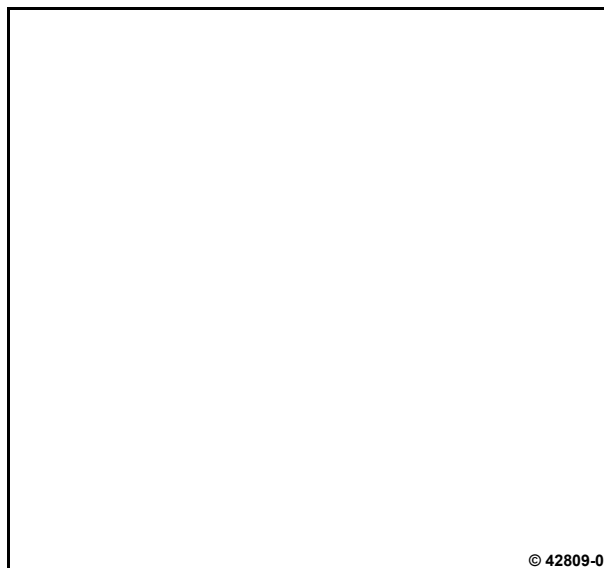




A07 046

Use new sealing rings.





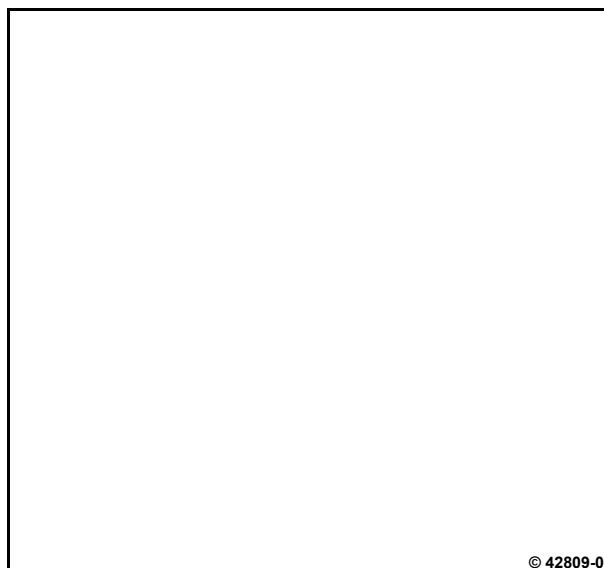
- Mount fuel line and fasten hollow screws (1) with new sealing rings without tension.
 - Use new sealing rings.
 - Do not tighten hollow screws.
- Position pipe clip and fasten screw (2) without tension.
 - Do not tighten screw.



- Mount connecting line and screw in hollow screws with new sealing rings without tension.
 - Use new sealing rings.
 - Note different screw lengths:
 - Hollow screw M14 (1)
 - Hollow screws M12 (2).
- Tighten hollow screw (1).
 -  A07 035
- Tighten hollow screws (2).
 -  A07 034



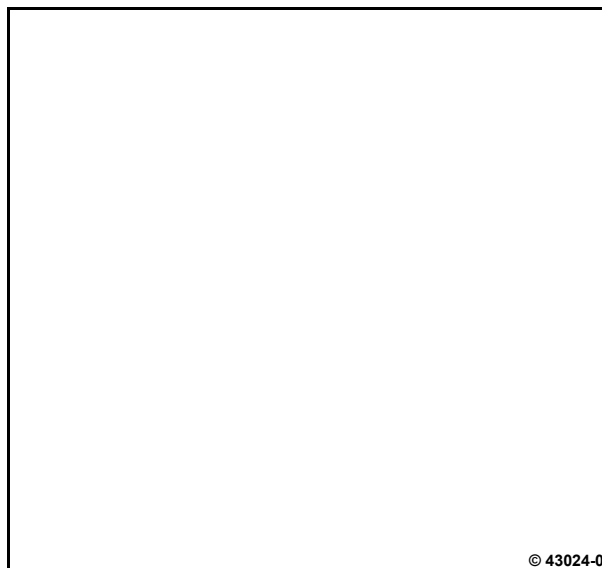
- Tighten hollow screws (1).
 -  A07 045
- Tighten screw (2).
 -  A07 087
- Check the fuel lines for perfect installation position.



- Tighten screws (arrows) alternately.



A07 032



© 43024-0

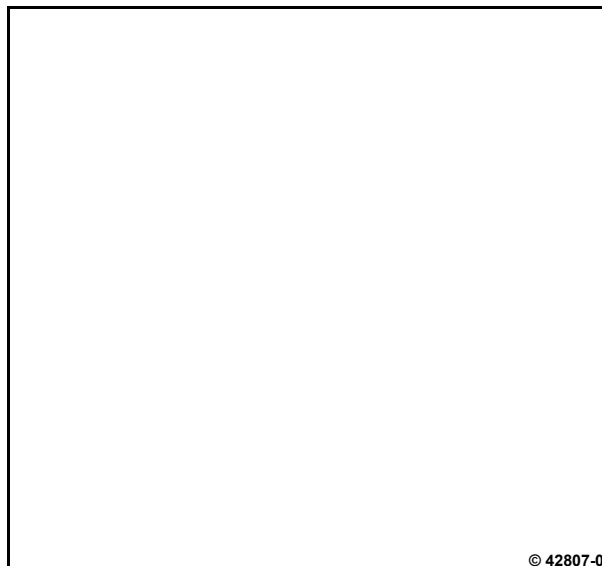
- Plug in the cable plug (1).
Ensure that the connection is perfect.

- Install rail.



W 07-15-08

- Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operating instructions.



© 42807-0

Removing and installing the high-pressure pump (Installation position A)



Commercial available tools

Special tools:

- Turning gear 100 330
- Assembly pliers. 103 220
- Assembly case with
assembly sleeves, guides
and disassembly tool 110 900
- Stoppers/caps 170 160



- Assembly aid
DEUTZ AP1908



- [User notes](#)
- [W 07-15-01](#)
- [W 07-15-08](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the high-pressure pump



Danger!

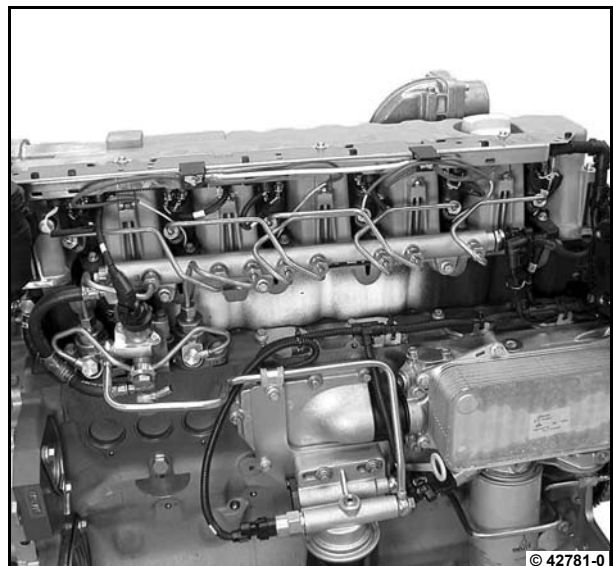
Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove rail.

 [W 07-15-08](#)

- Remove control block.

 [W 07-15-01](#)



- Unscrew screws (1) and remove high-pressure pump (2).

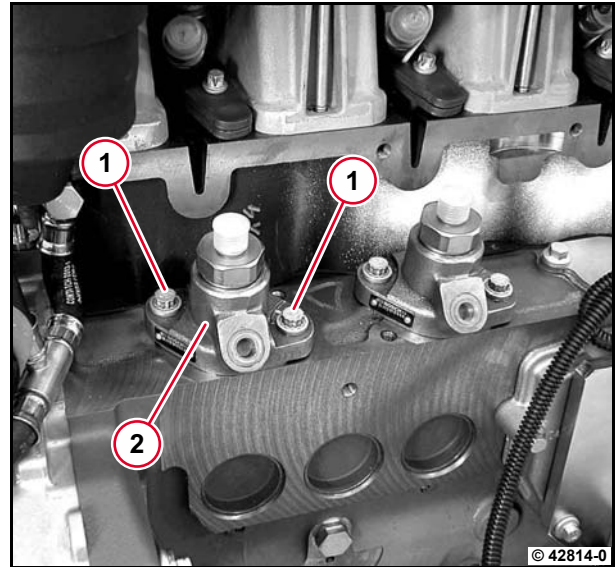


P00 50



Loosen screws evenly to avoid jamming the high pressure pump.

If necessary, turn the crankshaft with turning gear 100 330 in the direction of rotation of the engine until the high pressure pump is felt to release.

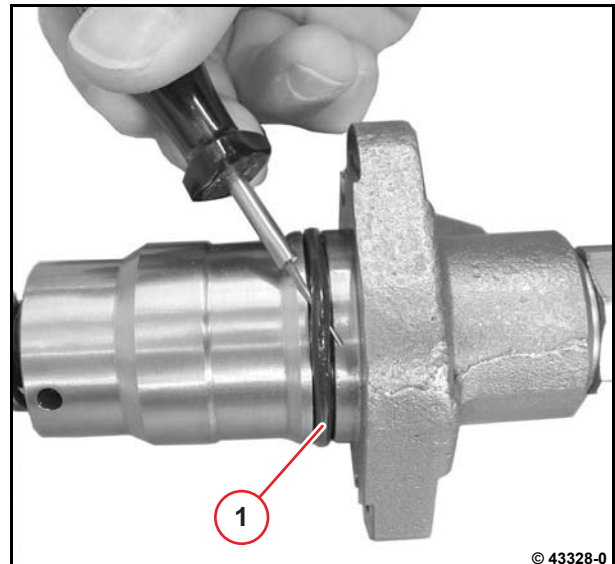


- Carefully remove the O-ring (1) from the high pressure pump with the disassembly tool.



Attention!

Do not damage the high pressure pump.



- Pull out the roller tappet (arrow) with the assembly pliers.



Attention!

Do not damage the roller tappet.

- Visually inspect the components.

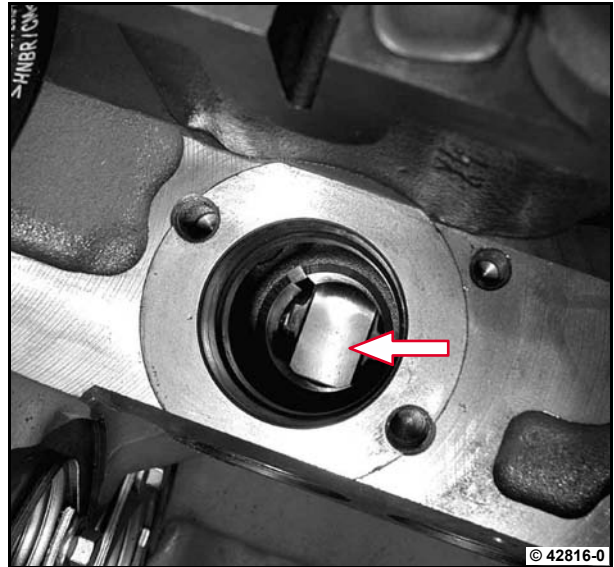


Installing the high pressure pump

- Turn the crankshaft until the cam for the high pressure pump is on the cam base circle (arrow).



Use the turning gear 100 330 to turn the crankshaft.

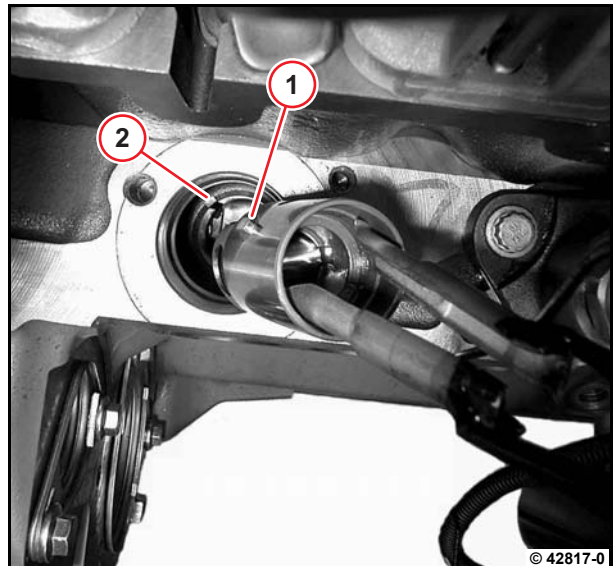


6

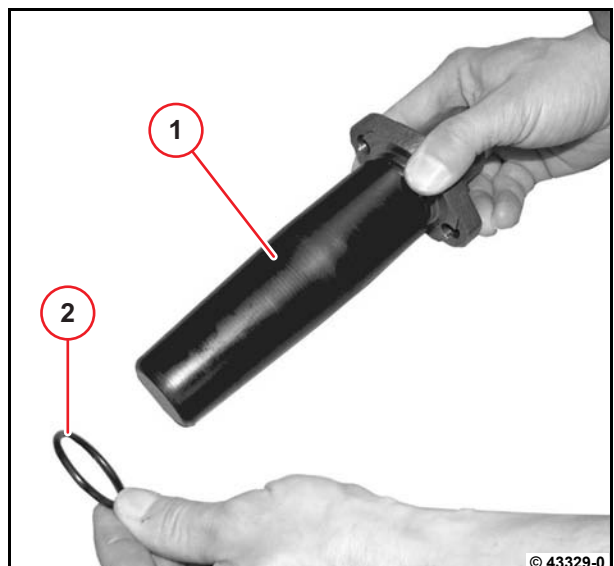
- Lightly oil the roller tappet and insert it.



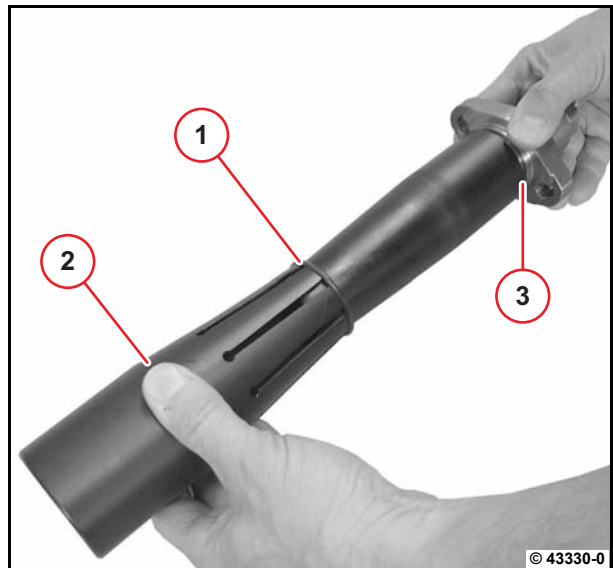
The guide pin (1) on the roller tappet must grip into the groove (2).



- Push assembly guide (1) onto high pressure pump.
- Push the O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the round sealing ring, mounting bore and chamfers in the crankcase with fitting compound.

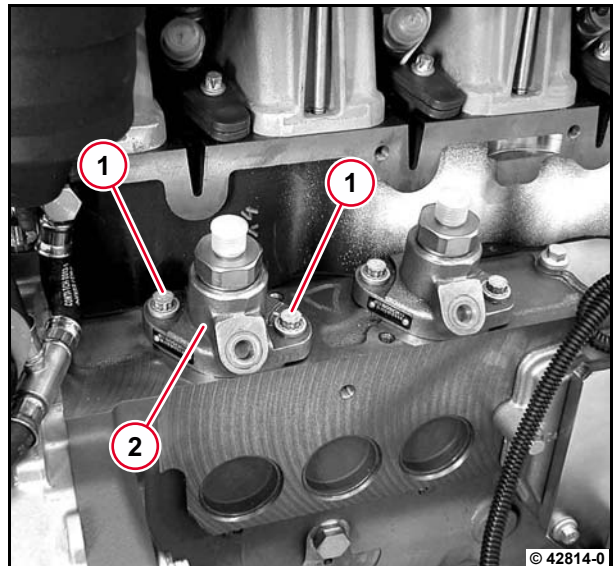


- Insert high pressure pump (2) and fasten screws (1) alternately.



Attention!

Do not tighten the screws of the high pressure pump until after installing the control block.



- Install control block.



W 07-15-01

- Tighten screws (arrows) of the high pressure pump.

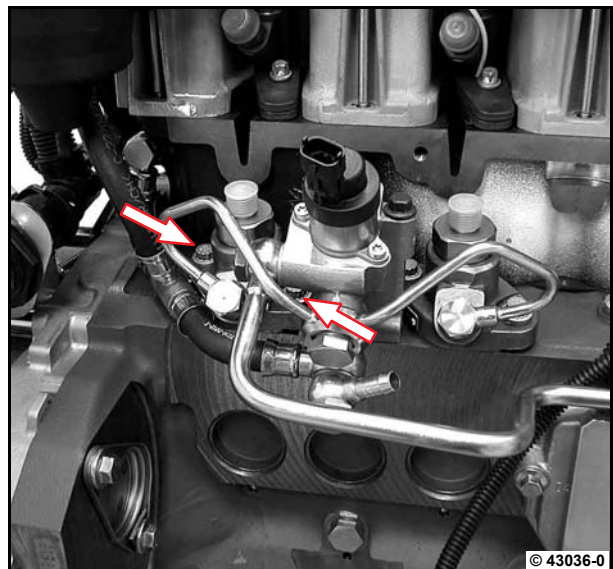


A07 031

- Install rail.



W 07-15-08



Remove and install high pressure pump (Installation position B)



Commercial available tools

Special tools:

- Turning gear 100 330
- Assembly pliers. 103 220
- Assembly case with
assembly sleeves, guides
and disassembly tool 110 900
- Stoppers/caps 170 160



- Fitting compound
DEUTZ AP1908



- [User notes](#)
- [W 07-15-01](#)
- [W 07-15-08](#)



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the high-pressure pump



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove rail.



[W 07-15-08](#)

- Remove control block.



[W 07-15-01](#)



- Unscrew screws (1) and remove high-pressure pump (2).

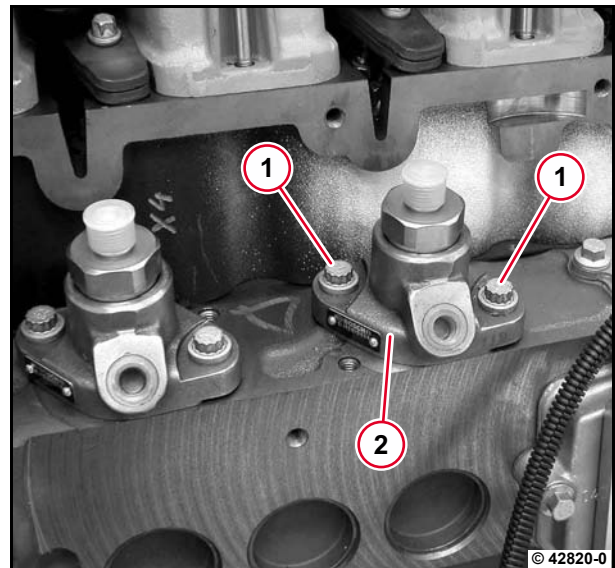


P00 50



Loosen screws evenly to avoid jamming the high-pressure pump.

If necessary, turn the crankshaft with turning gear 100 330 in the direction of rotation of the engine until the high-pressure pump is felt to release.

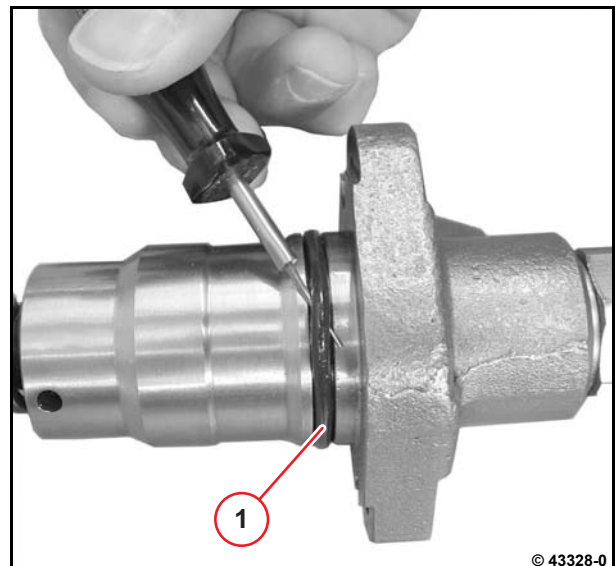


- Carefully remove the O-ring (1) from the high-pressure pump with the disassembly tool.



Attention!

Do not damage the high-pressure pump.



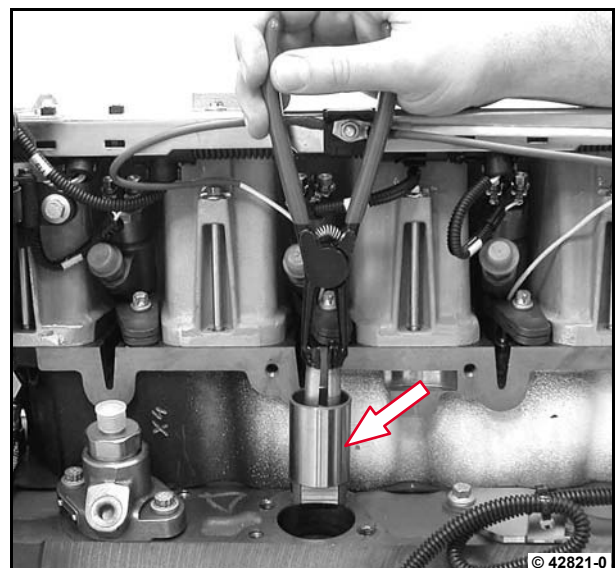
- Pull out the roller tappet (arrow) with the assembly pliers.



Attention!

Do not damage the roller tappet.

- Visually inspect the components.

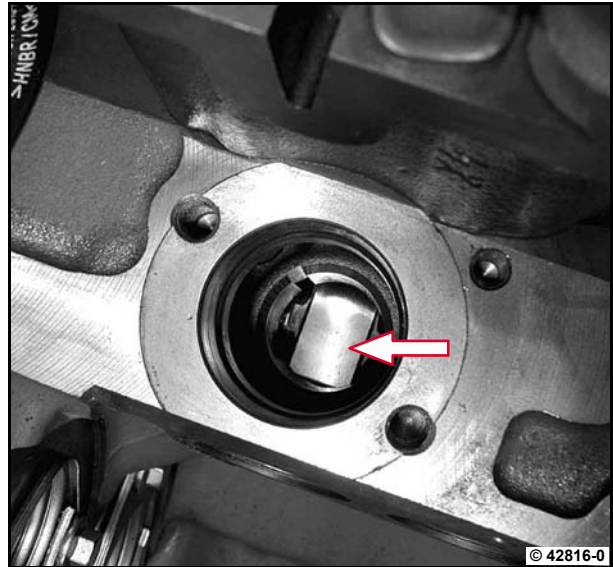


Installing the high-pressure pump

- Turn the crankshaft until the cam for the high-pressure pump is on the cam base circle (arrow).



Use the turning gear 100 330 to turn the crankshaft.

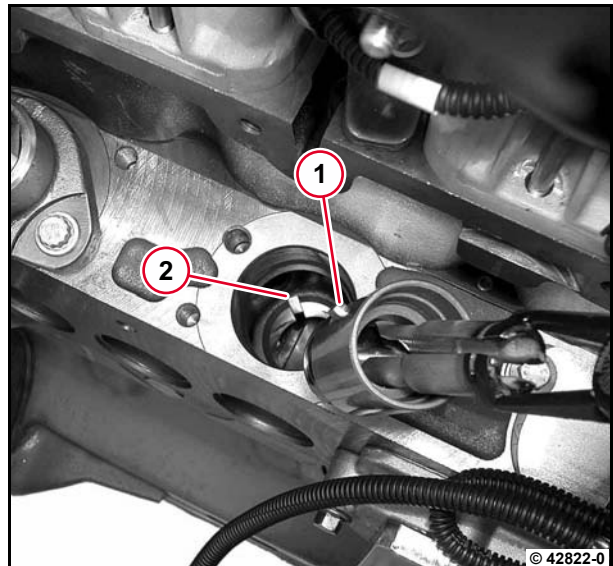


6

- Lightly oil the roller tappet and insert it.



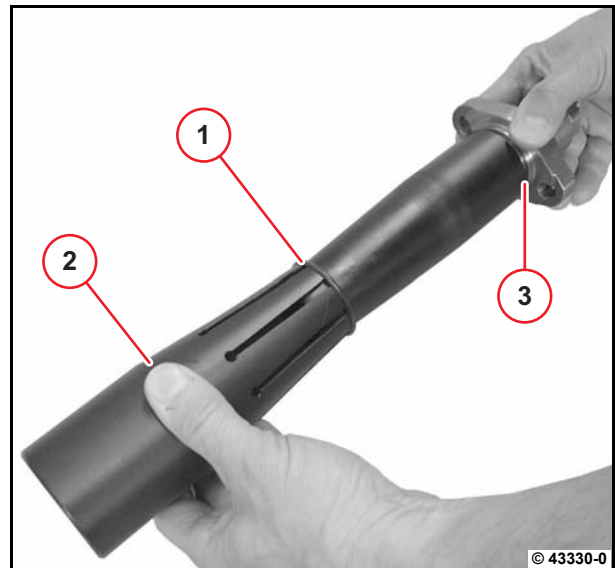
The guide pin (1) on the roller tappet must grip in the groove (2).



- Push assembly guide (1) onto high pressure pump.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).
- Coat the O-ring, mounting bore and chamfers in the crankcase with fitting compound.

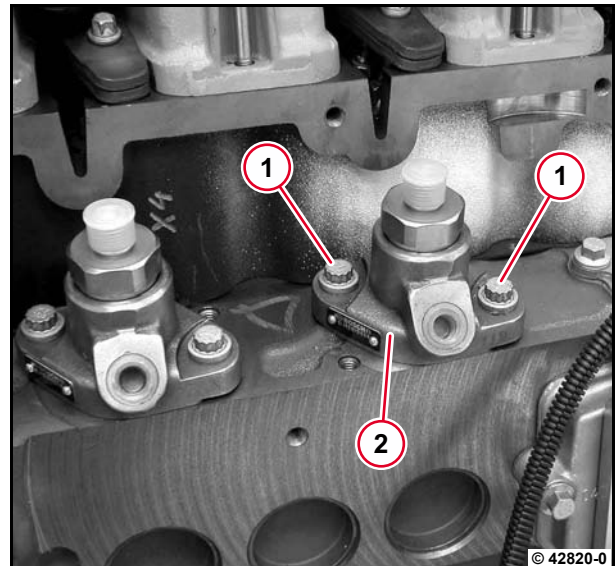


- Insert high-pressure pump (2) and fasten screws (1) alternately.



Attention!

Do not tighten the screws of the high pressure pump until after assembling the control block.



- Install control block.



W 07-15-01

- Tighten screws (arrows) of the high pressure pump.

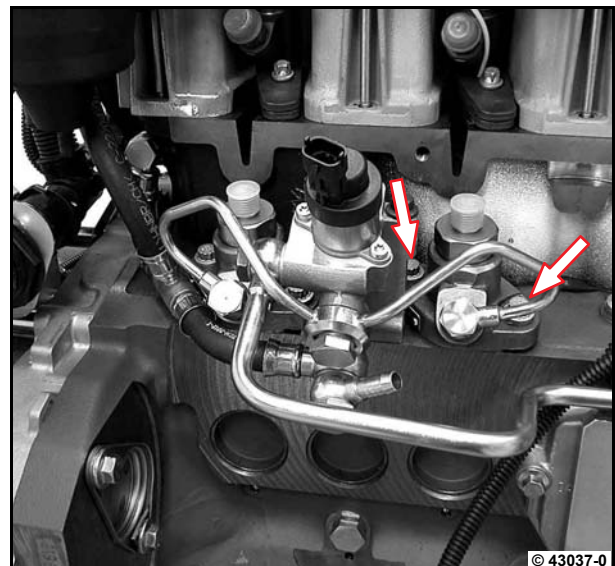


A07 031

- Install rail.



W 07-15-08



Remove and install rail



Commercial available tools

Special tools:

- Special wrench 110 500
- Stoppers/caps 170 160



– Fitting compound
DEUTZ AP 1908



– User notes



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Clean the area around the affected parts carefully. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

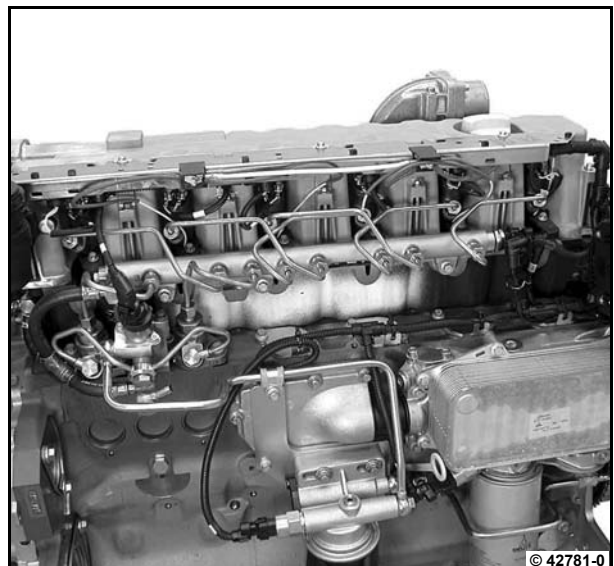
Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the rail



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



- Unscrew the union nuts (1) of the high-pressure lines with a special wrench from the high-pressure pumps and rail.

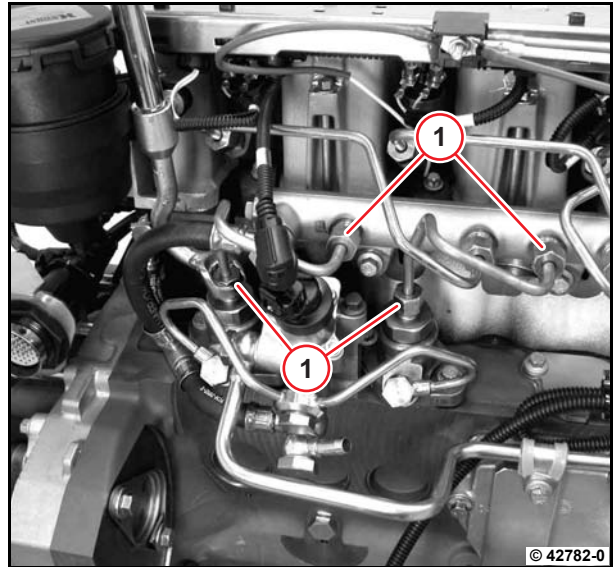


Support the pipe connection of the high-pressure pump.

- Remove the high-pressure lines.



Collect draining fuel and dispose of according to regulations.



- Unscrew the union nuts (1) of the injection lines from the injectors and rail using special wrench.

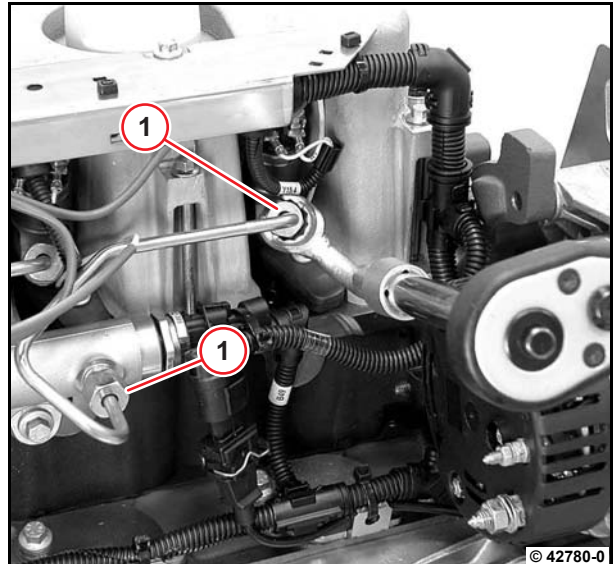


Support the pipe connection of the injector.

- Remove injection line.



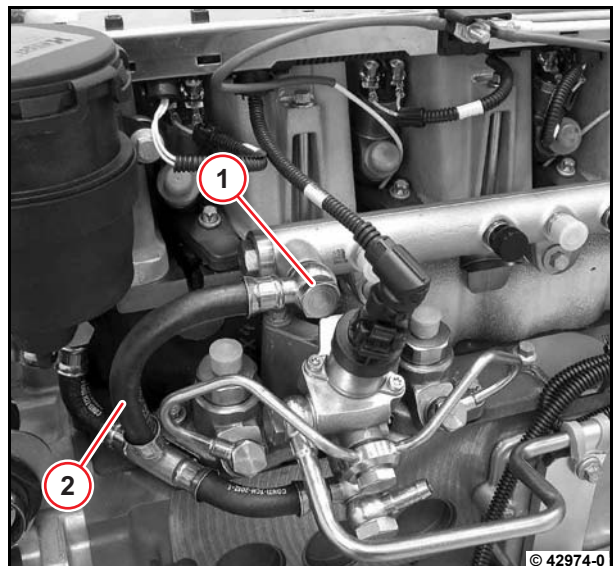
Collect draining fuel and dispose of according to regulations.



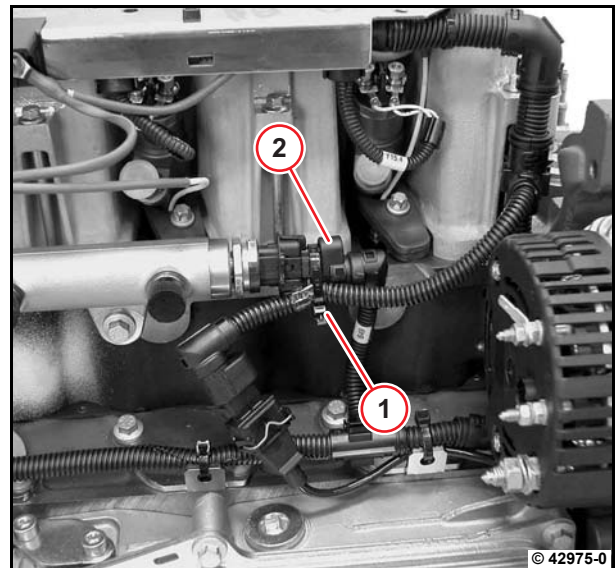
- Unscrew hollow screw (1), remove fuel return line (2) and sealing rings from rail.



Collect draining fuel and dispose of according to regulations.

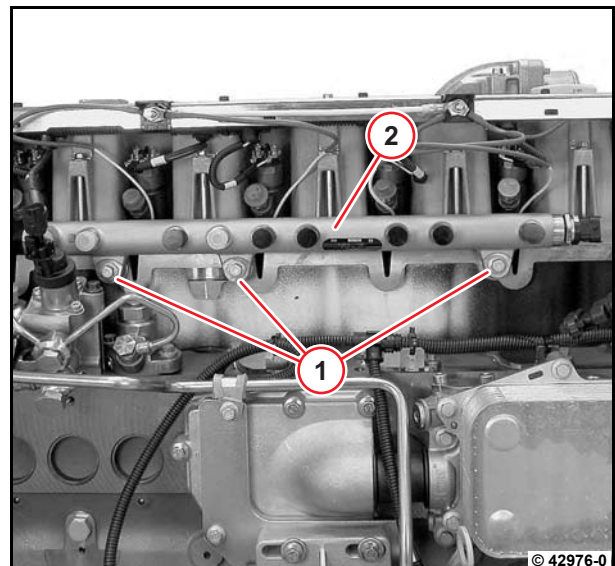


- Remove cable tie (1) and free cable.
- Unlock cable plug (2) and remove from rail pressure sensor.

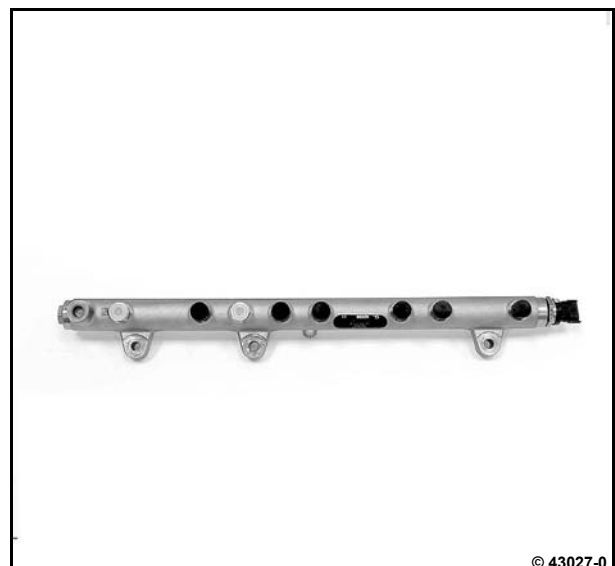


6

- Unscrew screws (1), remove rail (2) and spacing washers.



- Visually inspect the component.

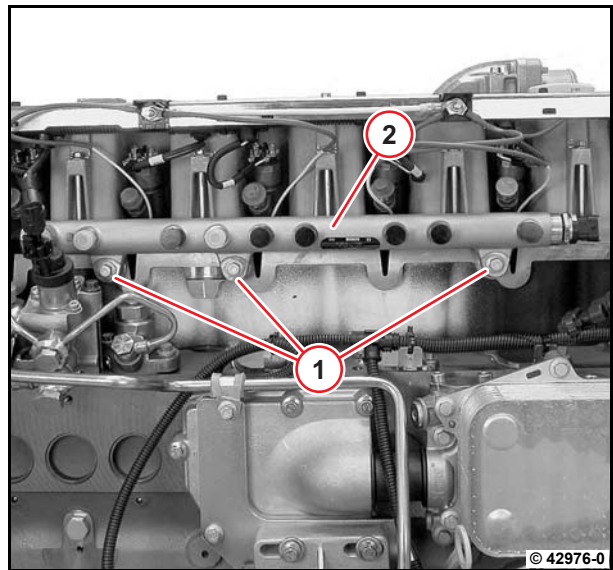


Mounting rail

- Mount the rail (2) with spacing washers and pre-assemble the screws (1) loosely.



Do not tighten screws.

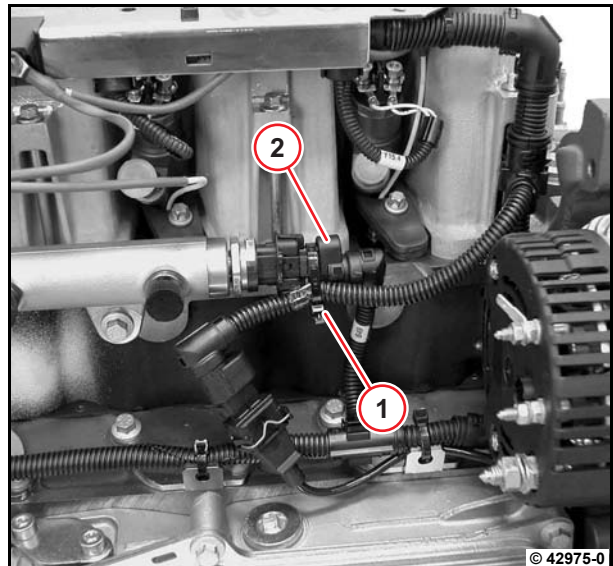


- Plug cable plug (2) into the rail pressure sensor.



Ensure that the connection is perfect.

- Lay cable and fix with cable tie (1).



Attention!

The injection pipes must always be renewed after disassembly.

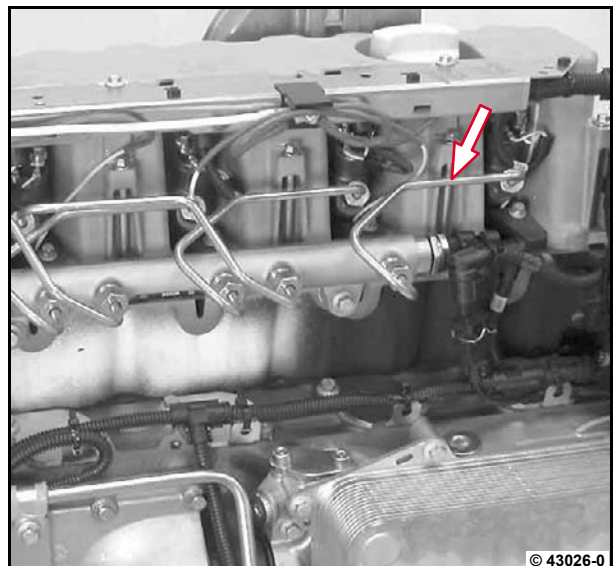
- Mount new injection lines (arrow) on rail and injectors and screw on union nuts.



Note assignment and installation position of the injection lines.

Do not tighten union nuts.

- Check the injection lines for perfect installation position.





Attention!

The high-pressure lines must always be renewed after disassembly.

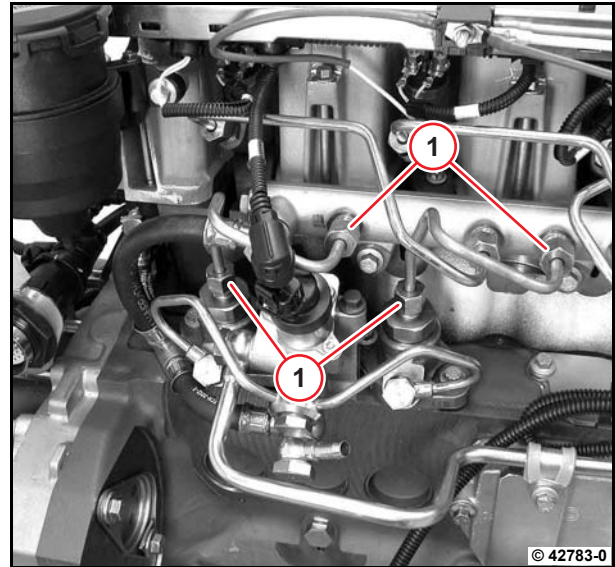
- Mount new high-pressure lines on high-pressure pumps and rail and screw on union nuts (1).



Note assignment and installation position of the high-pressure lines.

Do not tighten union nuts.

- Check the high pressure lines for perfect installation position.

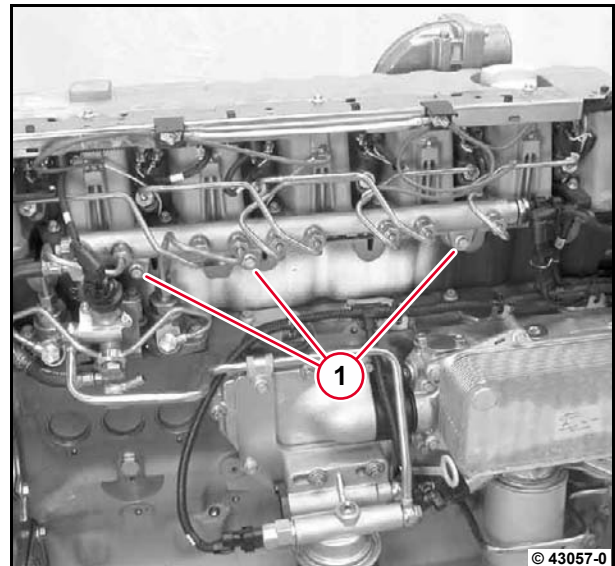


6

- Tighten screws (1).

 A07 038

●



- Tighten all union nuts (1) on the rail and on the injectors with a special wrench.

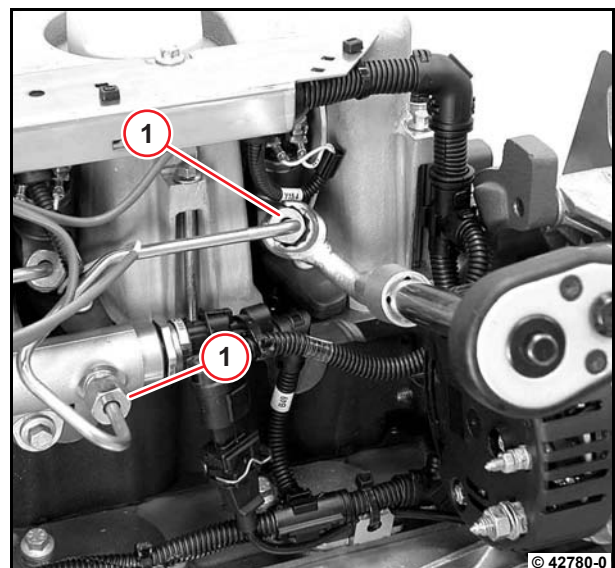
 A07 003



Attention!

Mount the injection lines without tension.

- Check the injection lines for perfect installation position.



- Tighten union nuts (1) with a special wrench.

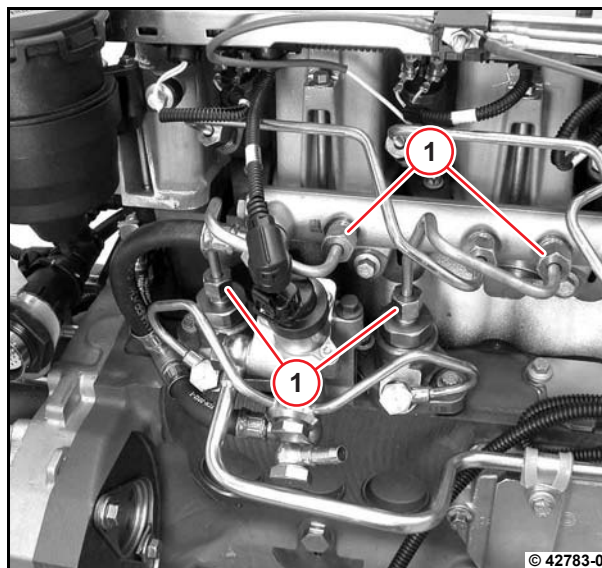
 A07 003



Attention!

Mount the high pressure lines without tension.

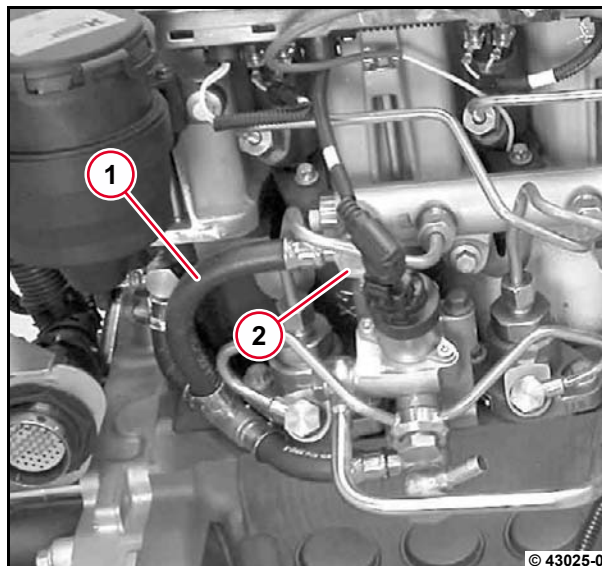
- Check the high pressure lines for perfect installation position.



- Install the fuel return line (1), tighten hollow screw (2) with new sealing rings.

 A07 045

- Bleed the fuel system according to the operating instructions via the fuel hand pump on the fuel pre-filter.



Remove and install injector

Commercial available tools:

- Assembly pliers 8024
- Torx tool set 8189

Special tools:

- Special wrench 110 500
- Assembly case with
assembly sleeves, guides
and disassembly tool 110 900
- Stoppers/caps 170 160

– [User notes](#)

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

Ensure utmost cleanliness when working on the fuel system.

Remove residue paint and particles of dirt before removing.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

6

Removing the injector

The following work procedure describes the removal and installation of an injector. Proceed in the same way to remove further injectors.

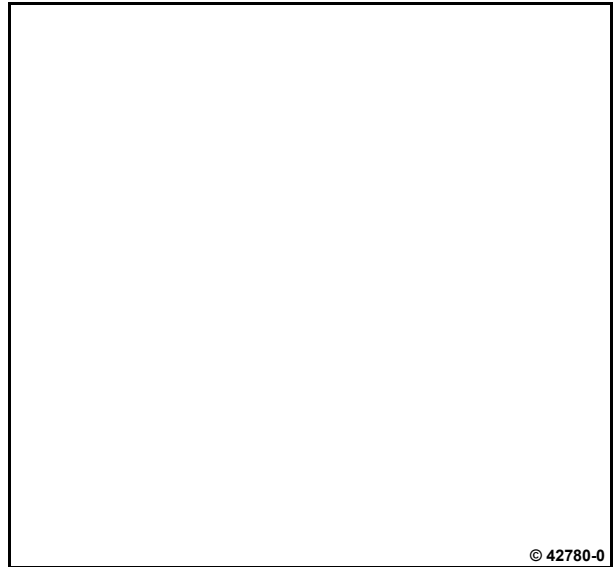
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

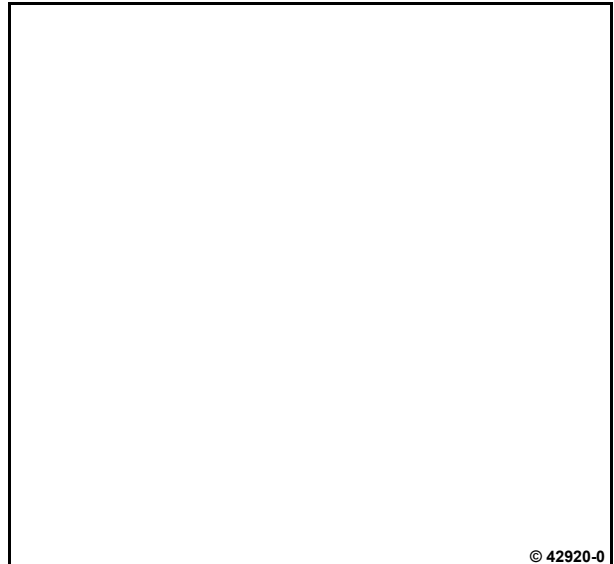


© 42781-0

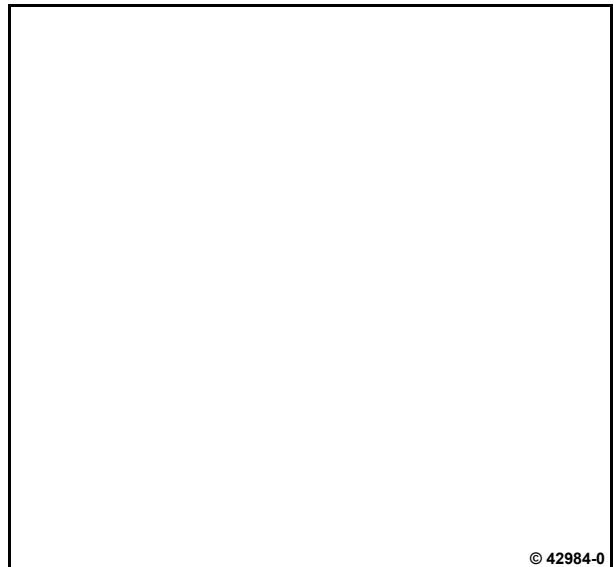
- Unscrew the union nuts (1) of the injection line from the injector and rail with a special wrench.
Support the pipe connection of the injector.
- Remove injection line.
Collect draining fuel and dispose of according to regulations.



- Unscrew screws (1) and remove cover plate (2).

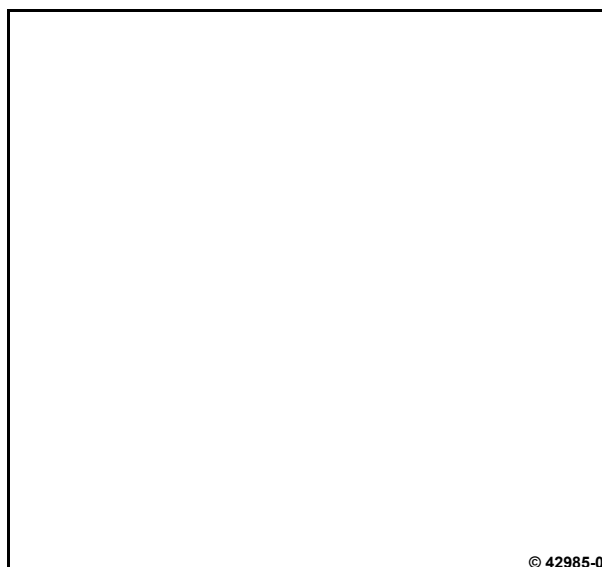


- Unscrew nuts (1) and remove cable plug from injector.



- Unscrew screw (1) and remove clamping shoe (2).

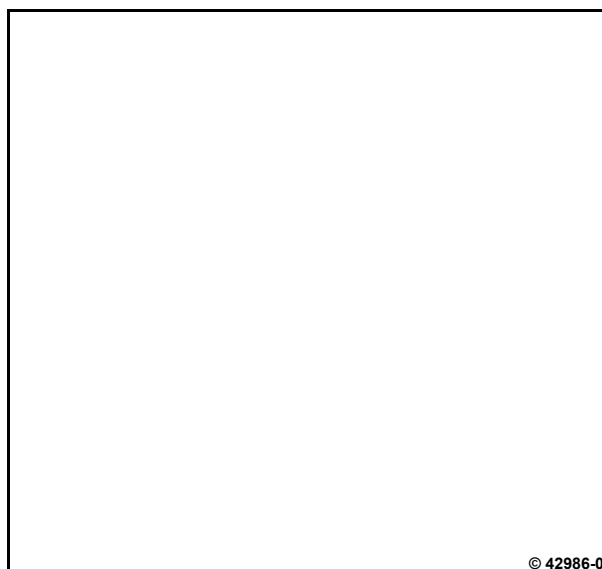
When removing the injectors on cylinders 2 to 5, the clamping shoe can only be removed together with the injector.



- Pull out injector (1) and sealing ring (arrow).

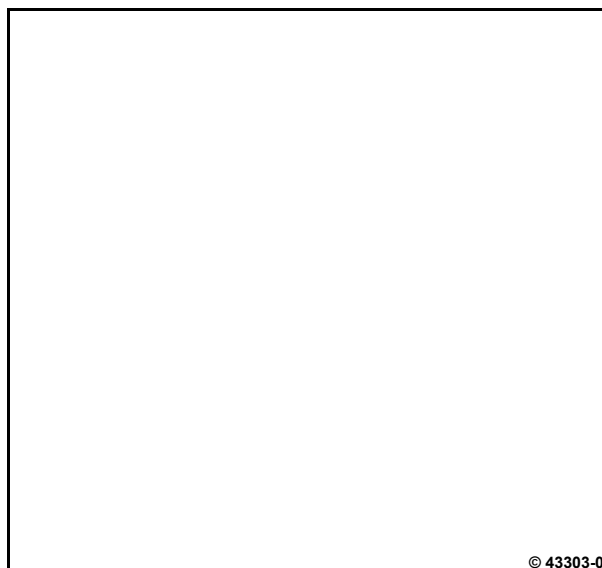
Attention!

Remove residue paint and particles of dirt from the injector before removing it. Carefully clean the area around the injector.

**Attention!**

Do not brush off the nozzle tip of the injector. Do not damage the nozzle tip on the injector when removing the sealing ring (1).

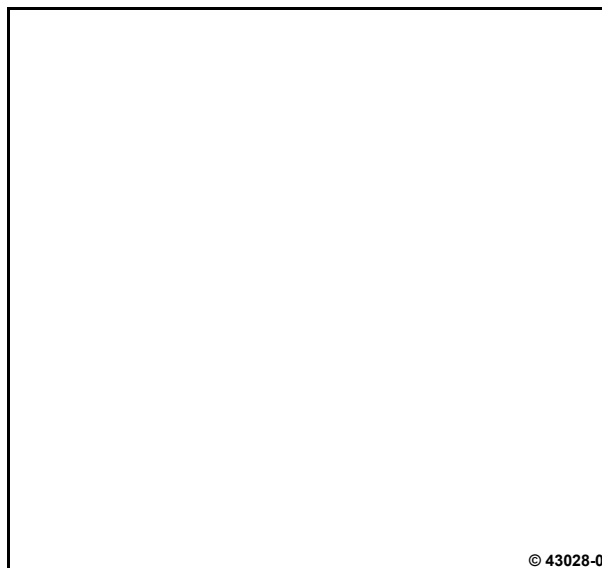
- Grip a tight sealing ring (1) with the assembly pliers (2) and pull off, turning slightly.



- Remove the O-ring (1) carefully from the injector with the disassembly tool.

Attention!

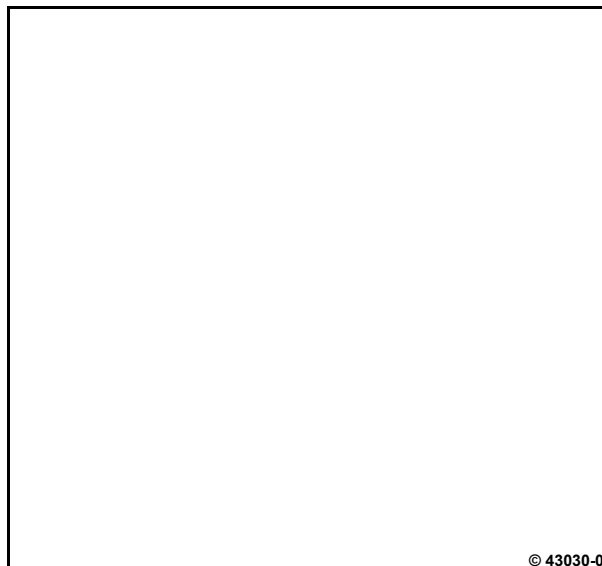
Do not damage the injector.



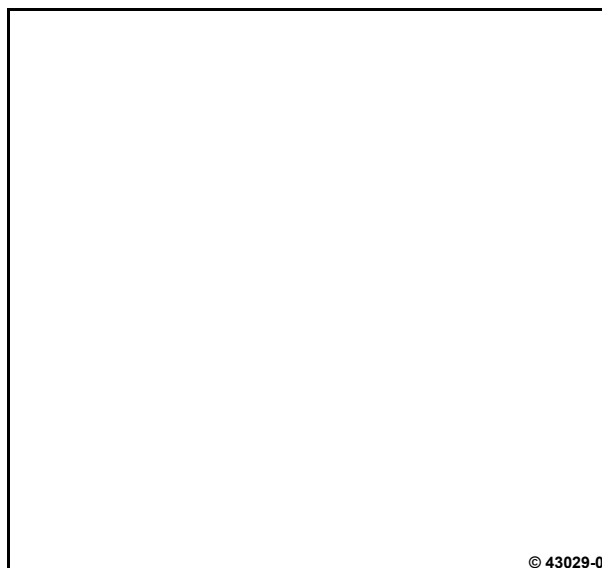
6

Install the injector

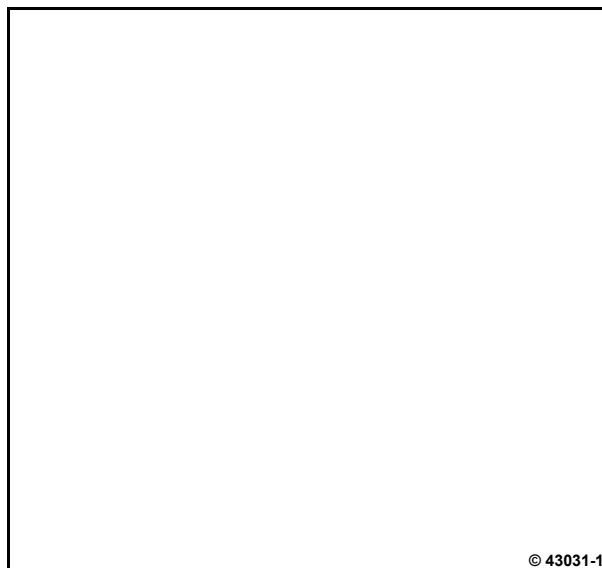
- Push assembly guide (1) onto injector.
- Push the new O-ring (2) onto the assembly guide.



- Push the O-ring (1) with assembly sleeve (2) up to the groove (3).



- Mount new sealing ring (1) on injector.



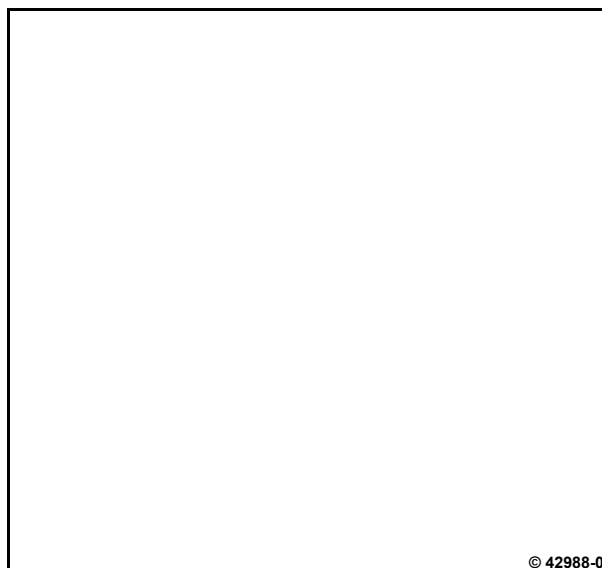
- Lightly oil O-ring (1).

**Attention!**

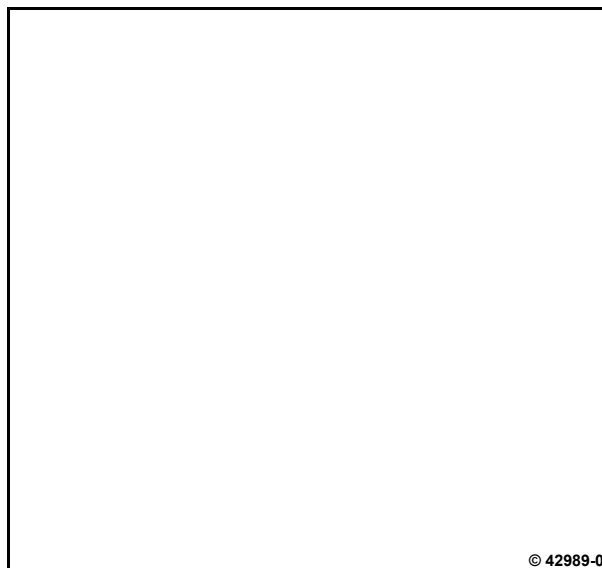
Before installing the injector, combustion residue must be cleaned carefully from the bore on the cylinder head.
Suck off dirt particles.

- Insert injector carefully in the cylinder head.

When installing the injectors on cylinders 2 to 5, the clamping shoe must be inserted together with the injector.



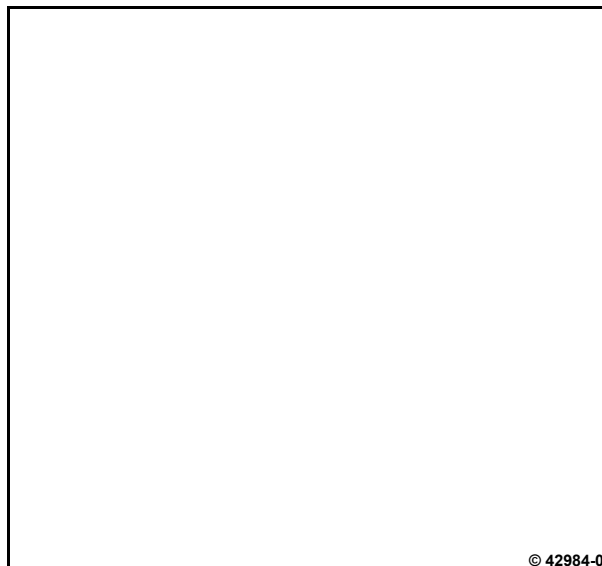
- Mount the clamping shoe and tighten the screws.
Make sure the cable (arrow) is in place.
Do not tighten the screw until after assembling the injection line.



- Mount cable plug on injector and tighten nuts (1).



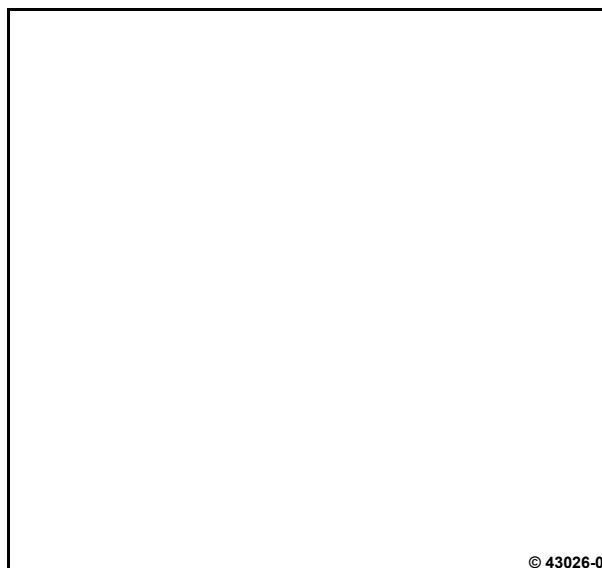
A13 051



Attention!

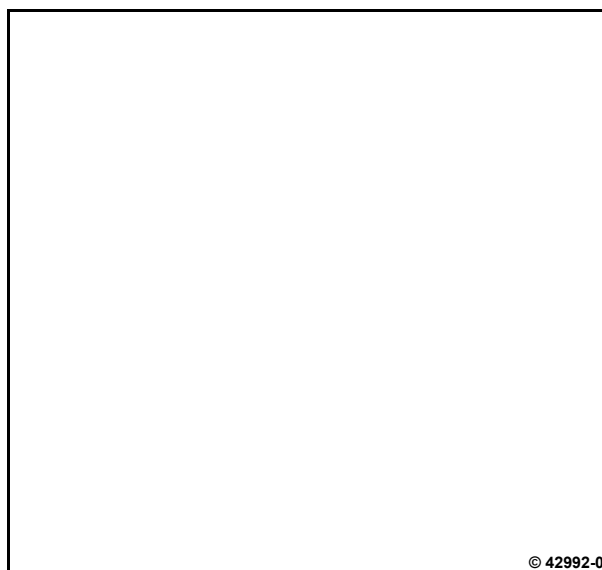
The injection lines must always be renewed after disassembly.

- Mount new injection line (arrow) on rail and injector and screw on union nuts.
Note assignment and installation position of the injection lines.
Do not tighten union nuts.
- Check the injection line for perfect installation position.



- Tighten screw (arrow) of the clamping shoe.

 A07 001

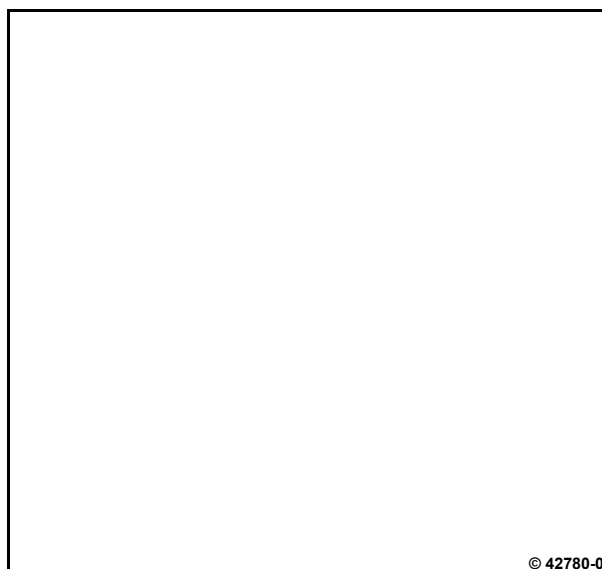


- Tighten union nuts (1) of the injection line.

 A07 003

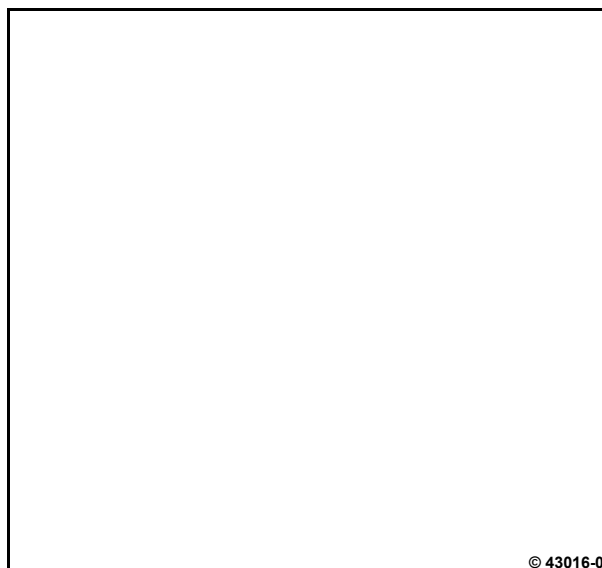
Attention!

Mount the injection line without tension.



- Mount the cover plate (1) and tighten the screws (arrows).

 A13 041



Remove and install pressure limiting valve



Commercial available tools

Special tools:

- Disassembly tool 110 901
- Stoppers/caps 170 160



– Assembly grease 01016496



– User notes



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail.

Ensure utmost cleanliness! Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Removing the pressure limiting valve



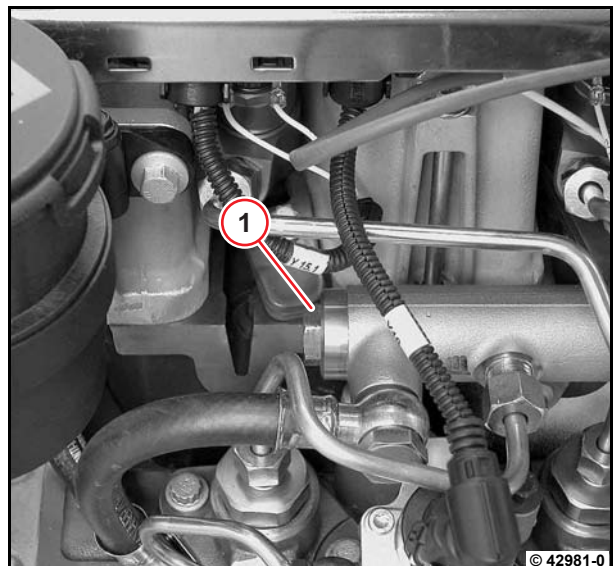
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

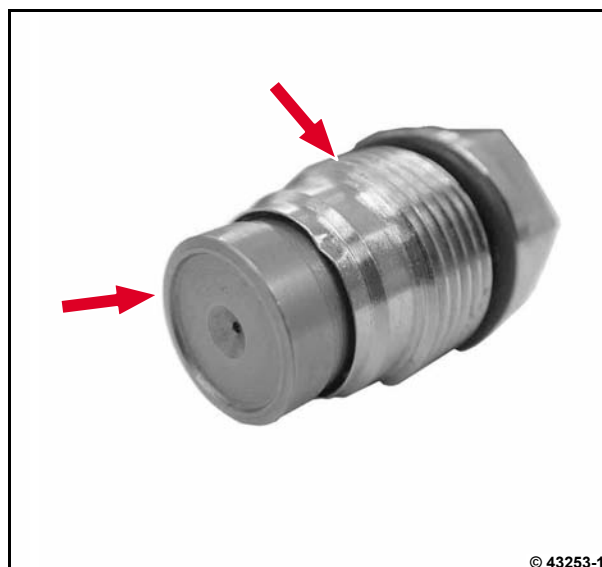
- Unscrew pressure limiting valve (1).



Collect draining fuel and dispose of according to regulations.



- Visually check the thread and the sealing edge of the pressure limiting valve.



- Remove the O-ring with the disassembly tool.



Installing the pressure limiting valve



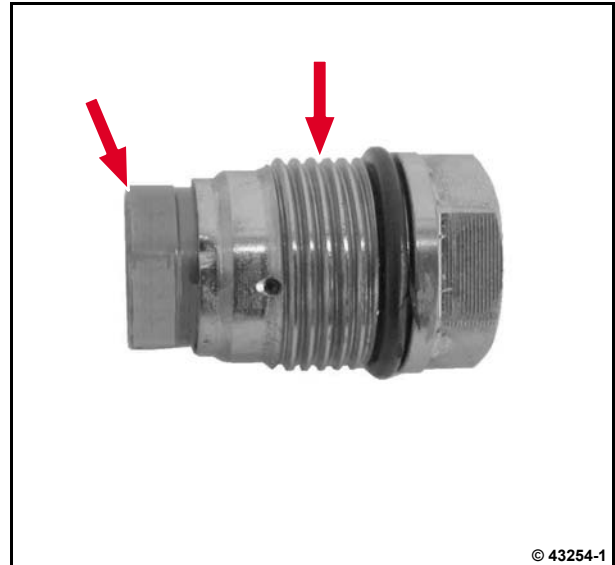
Attention!

No foreign bodies may get into the rail. Ensure utmost cleanliness! Especially on the thread and the sealing surface of the rail.

- Lightly coat new O-ring (arrow) with assembly grease and pull onto the pressure limiting valve.



- Lightly coat the thread and sealing edge of the pressure limiting valve with assembly grease.



- Insert and tighten pressure limiting valve.



A07 039

- Bleed the fuel system via the manual fuel pump on the fuel pre-filter, according to the operating instructions.



Removing and installing the rail pressure sensor



Commercial available tools

Special tools:

- Long socket wrench set 110 700
- Stoppers/caps 170 160



- Assembly grease 01016496



– User notes



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

No foreign bodies may get into the rail.

Ensure utmost cleanliness! Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

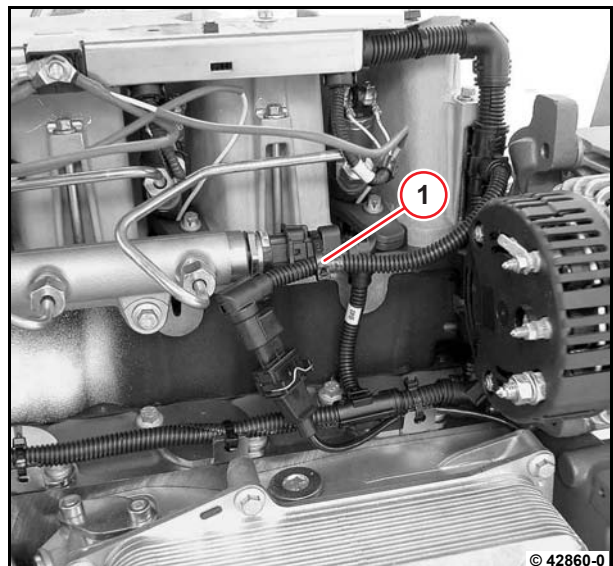
Removing the rail pressure sensor



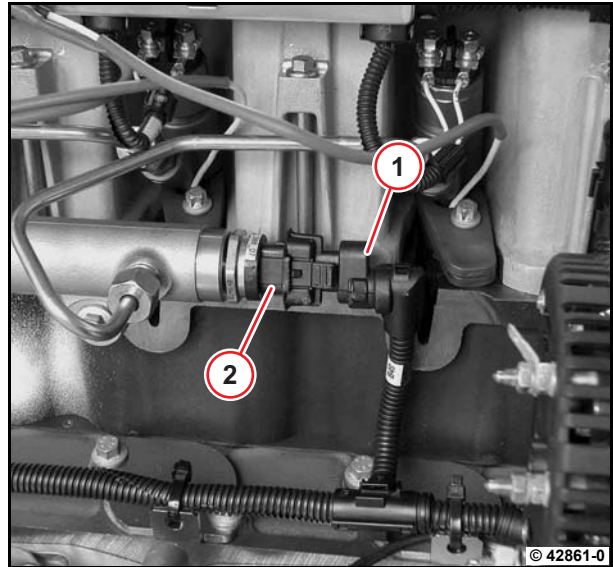
Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Remove cable tie (1) and free cable.



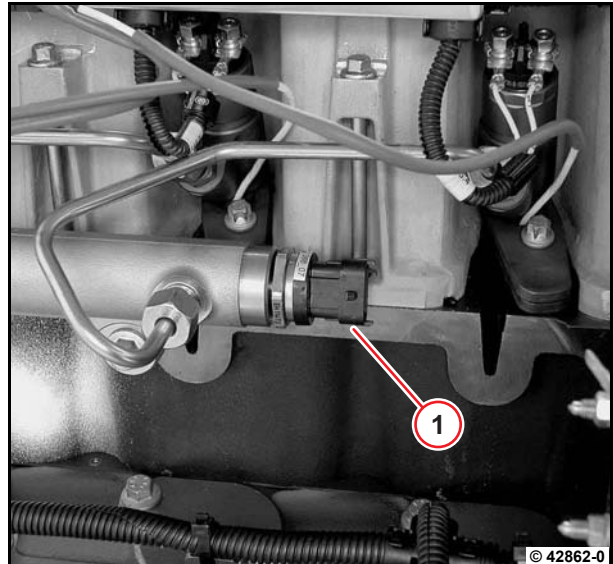
- Release cable plug (1) and pull off from the rail pressure sensor (2).



- Unscrew the rail pressure sensor (1) with the socket wrench.



Collect draining fuel and dispose of according to regulations.



Attention!

Do not touch the pin contacts of the rail pressure sensor with your hands to avoid electrostatic discharge.

- Visually check the thread and the sealing edge (arrows) of the rail pressure sensor.



Installing the rail pressure sensor



Attention!

No foreign bodies may get into the rail. Ensure utmost cleanliness! Especially on the thread and the sealing surface of the rail.

- Lightly coat the thread and sealing edge (arrows) of the rail pressure sensor with assembly grease.

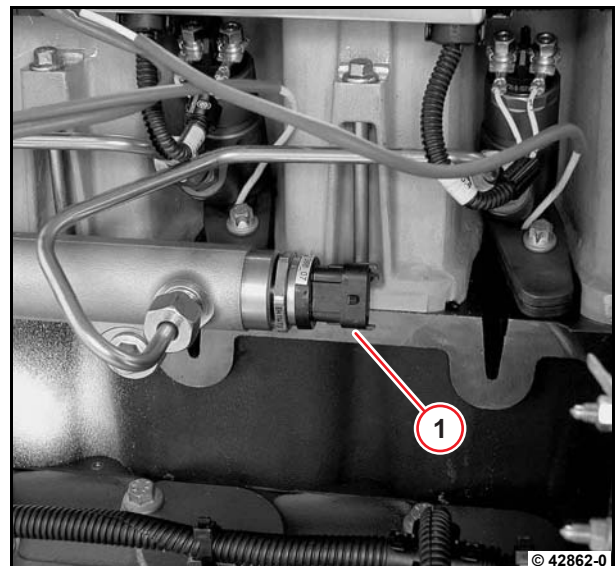


6

- Insert and tighten rail pressure sensor (1).



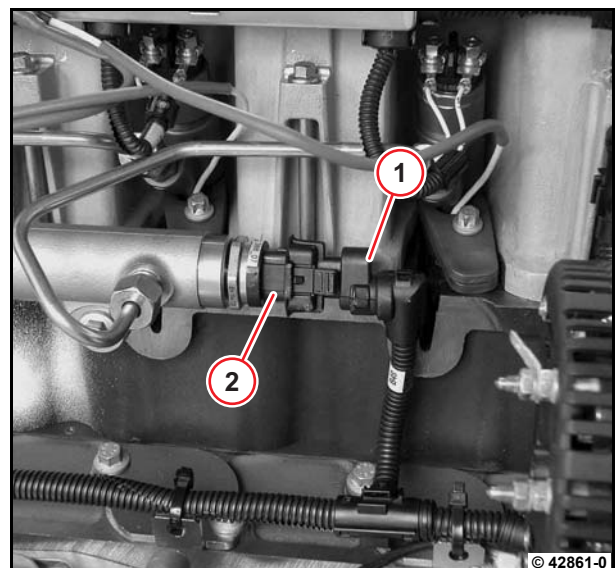
A07 040



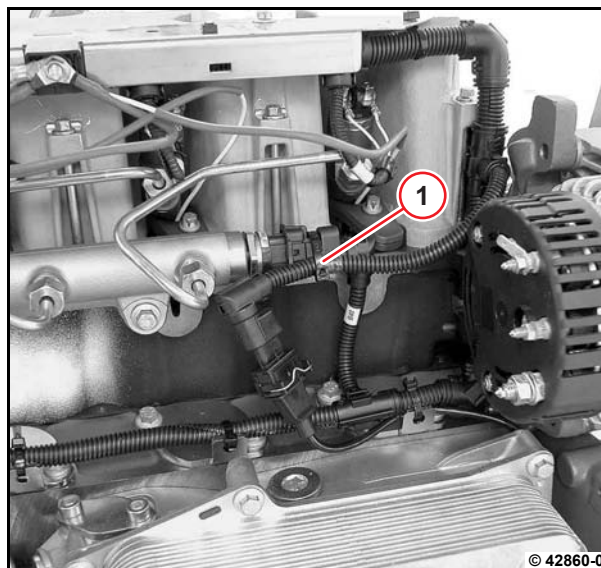
- Plug the cable plug (1) into the rail pressure sensor (2).



Ensure that the connection is perfect.



- Lay cable and fix with cable tie (1).
- Bleed the fuel system via the manual fuel pump on the fuel pre-filter according to the operating instructions.



Removing and installing the fuel pressure sensor

Commercial available tools

– [User notes](#)

Special tools:

- Long socket wrench set 110 700
- Stoppers/caps 170 160

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

Ensure utmost cleanliness when working on the fuel system.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Ensure utmost cleanliness! Especially on the thread and the sealing surface of the rail.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps. Do not remove stoppers/caps until immediately before assembling.

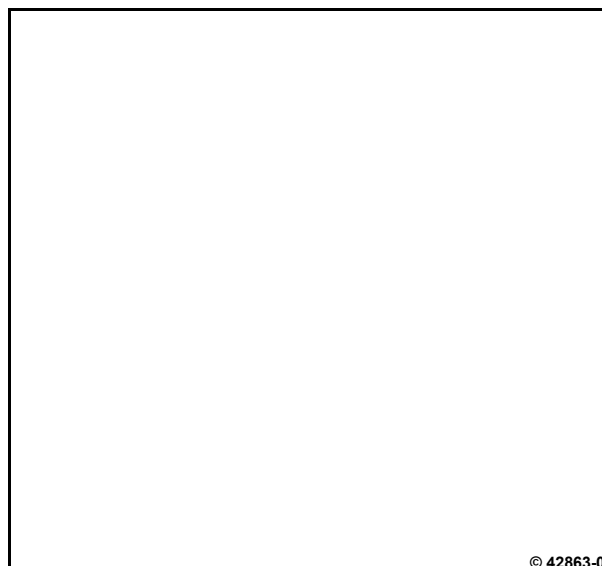
6

Removing the fuel pressure sensor

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

- Release cable plug (1) and pull off from the fuel pressure sensor (2).



© 42863-0

Fuel system

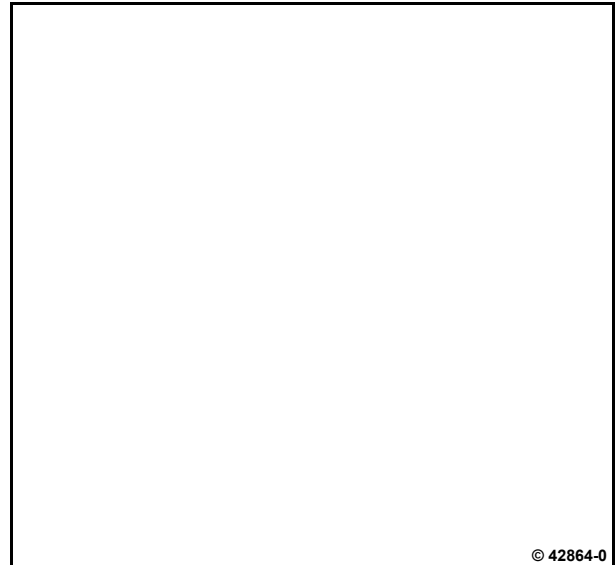
W 07-15-18

TCD 2012 2V

- Unscrew fuel pressure sensor (1) with the socket wrench.

Collect draining fuel and dispose of according to regulations.

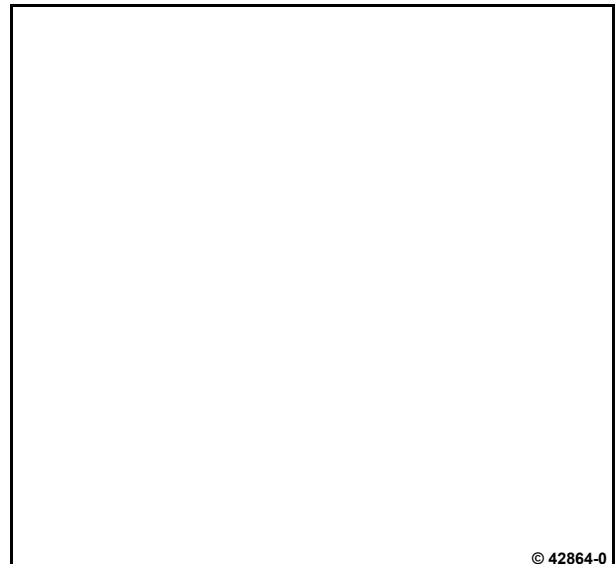
- Visually inspect the components.



Installing the fuel pressure sensor

- Tighten fuel pressure sensor (1) with new sealing ring.

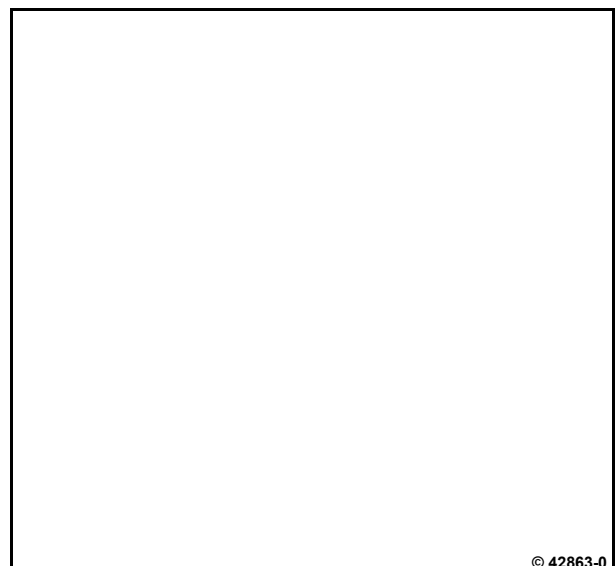
 A07 090



- Plug the cable plug (1) into the fuel pressure sensor (2).

Ensure that the connection is perfect.

- Bleed the fuel system via the fuel hand pump on the fuel pre-filter according to the operating instructions.



Removing and installing the oil suction intake pipe




Commercial available tools

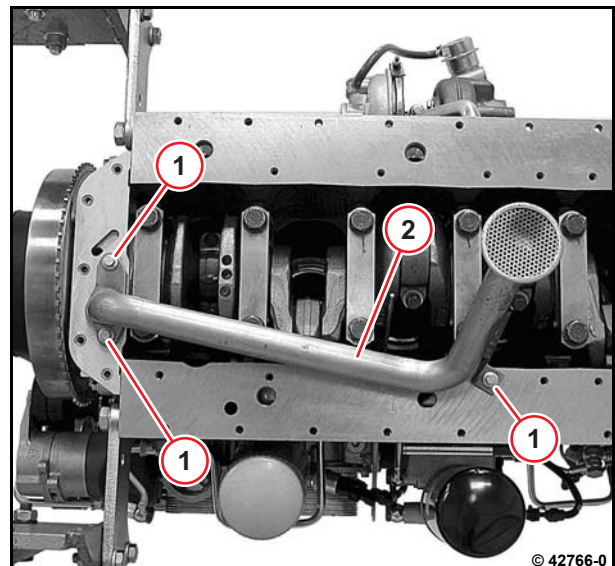


– W 08-04-07

6

Removing the oil suction intake pipe

- Remove lube oil tray.
 W 08-04-07
- Unscrew screws (1), remove oil suction intake pipe (2) and gasket.
- Visually inspect the components.



Installing the oil suction intake pipe.

- Clean the sealing surface on the oil suction intake pipe and the front cover.
- Mount oil suction intake pipe with new gasket and fasten screws.

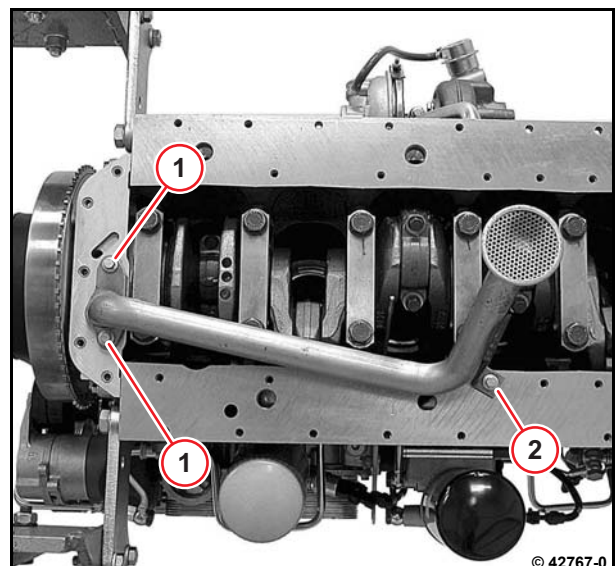


Note installation position of the gasket.

Note different screw lengths:

Screws M8 x 25 mm (1)

Screw M8 x 15 mm (2)

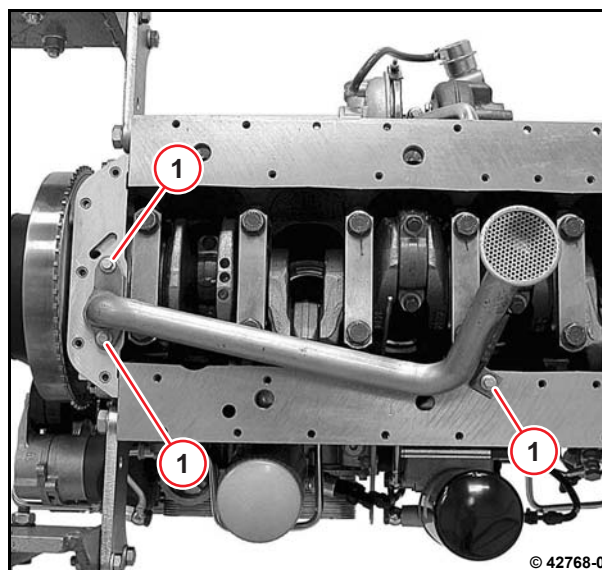


- Tighten screws (1).

 **A08 015**

- Install lube oil tray.

 **W 08-04-07**



Removing and installing the lube oil tray



Commercial available tools



– Packing compound
DEUTZ DW 74



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The engine oil should be filled according to the operating manual.

6

Removing the lube oil tray

- Unscrew cap (1) and drain engine oil.

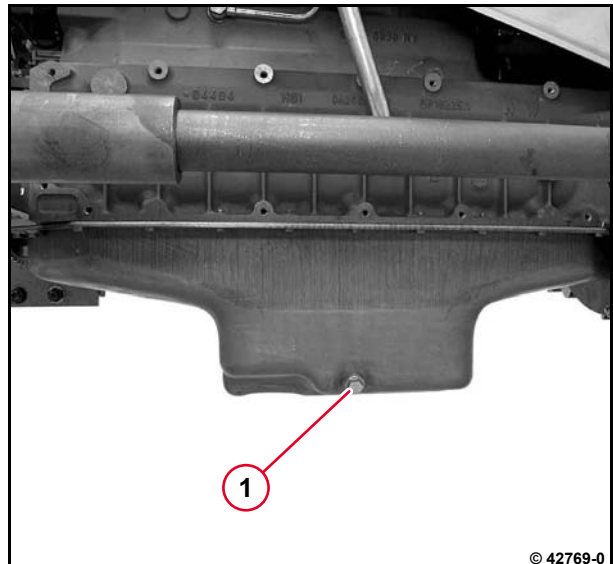


Collect the engine oil and dispose of according to regulations.

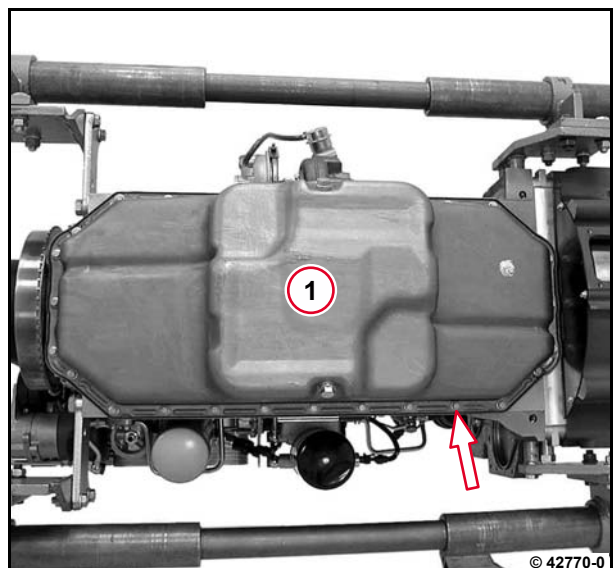
- Tighten screw plug with new sealing ring.



A03 031



- Unscrew all screws (arrow) and remove lube oil tray (1).
- Visually inspect the components.



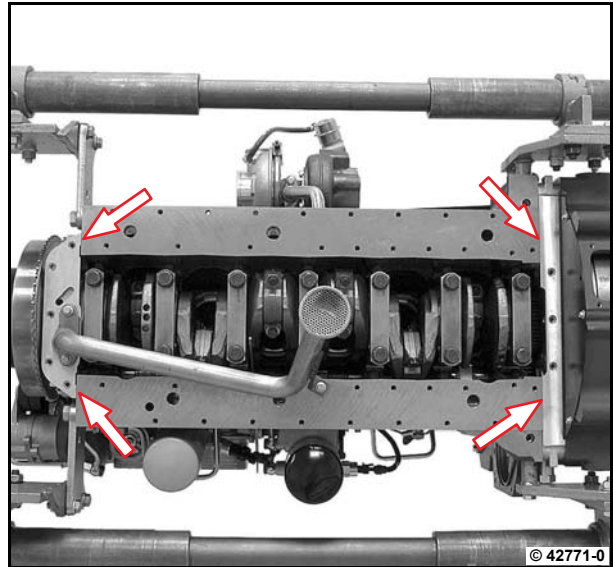
Installing the lube oil tray

- Clean the sealing surface on the lube oil tray and crankcase.



The sealing surfaces must be dry and free from grease and dirt.

- Apply packing compound to the joints (arrows).



- Mount gasket on crankcase and mount lube oil tray.



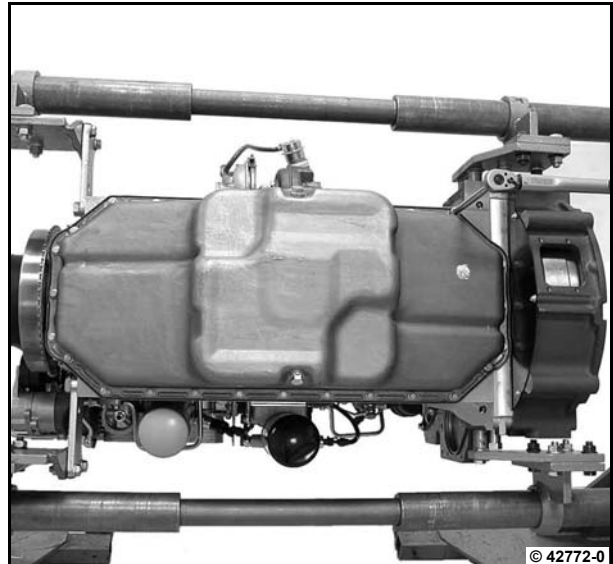
Do not move the gasket when mounting the lube oil tray.

- Tighten all screws alternately.



A03 030

- Fill in prescribed engine oil.



Remove and install oil cooler



Commercial available tools



– Fitting compound
DEUTZ AP 1908



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The appropriate operating manual should be observed for emptying and filling the engine.

6

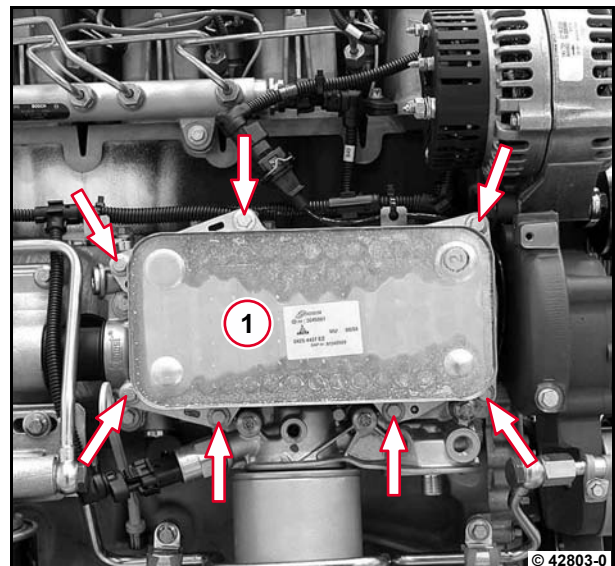
Removing the oil cooler

- Unscrew screws (arrows) and remove oil cooler (1).



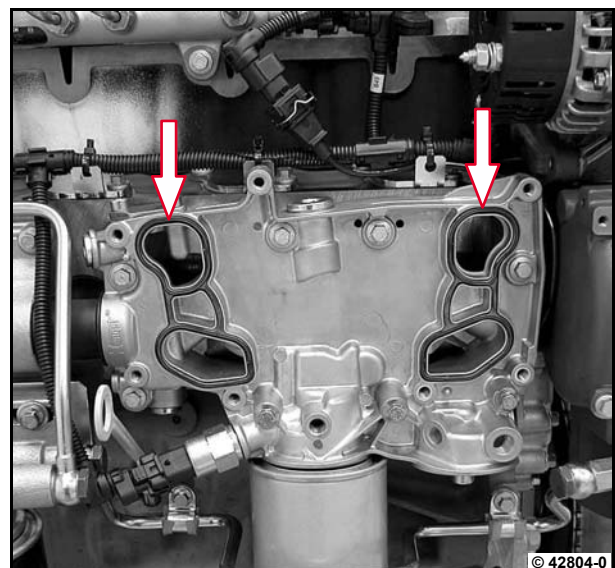
Collect draining engine oil and dispose of according to regulations.

- Remove gaskets.
- Visually inspect the components.



Installing the oil cooler

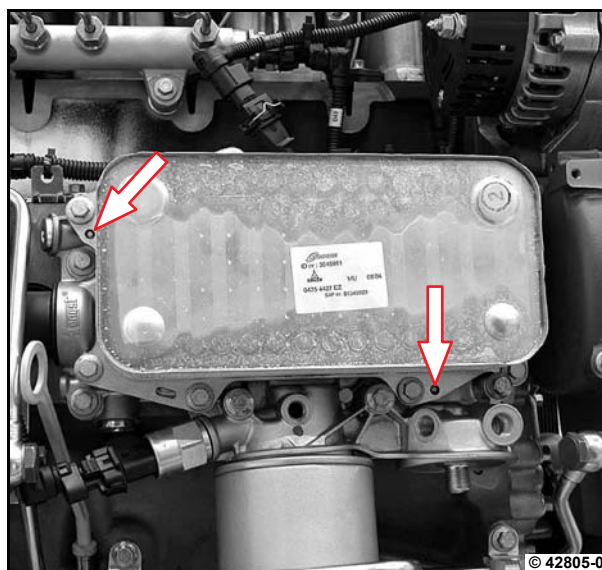
- Clean the sealing surfaces on the oil cooler and oil cooler housing.
- Coat new gaskets (arrows) with fitting compound and insert.



- Mount the oil cooler and fasten the screws alternately.



The fixing bolts on the oil cooler housing must grip in the holes of the oil cooler (arrows).

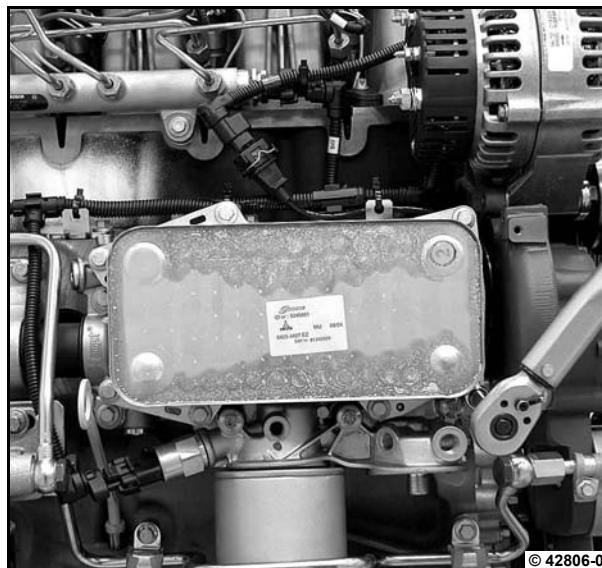


© 42805-0

- Tighten screws alternately.



A08 052



© 42806-0

Removing and installing the oil cooler housing



Commercial available tools



– Fitting compound
DEUTZ AP 1908



– W 08-08-02
– W 08-10-06



Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the oil cooler housing

- Remove oil cooler.



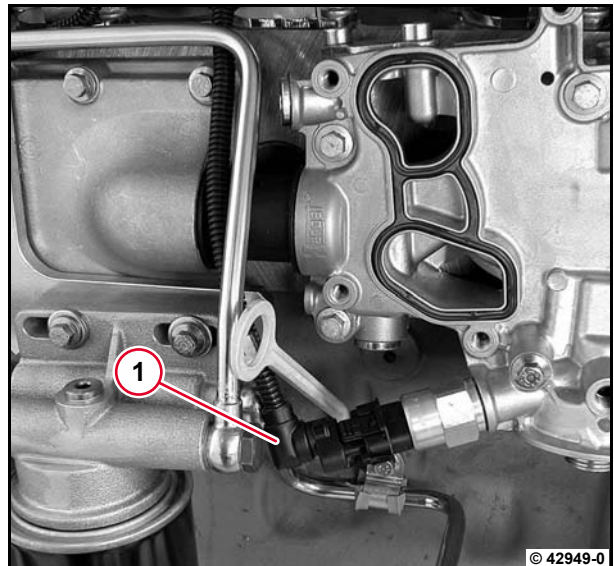
W 08-08-02

- Remove oil filter cartridge.

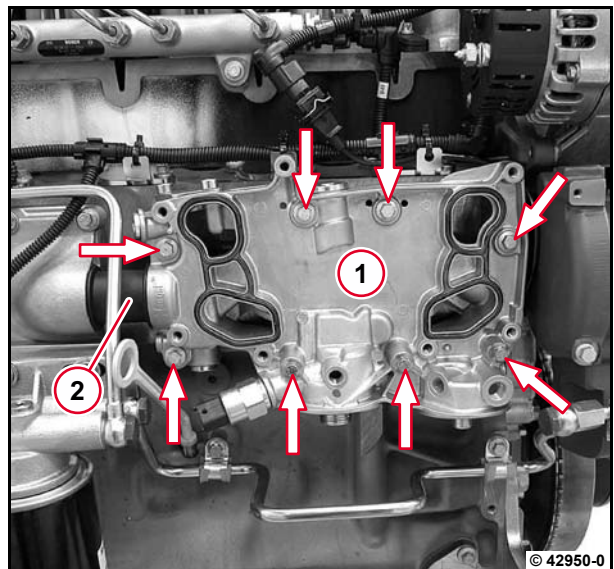


W 08-10-06

- Unlock cable plug (1) and remove from oil pressure sensor.



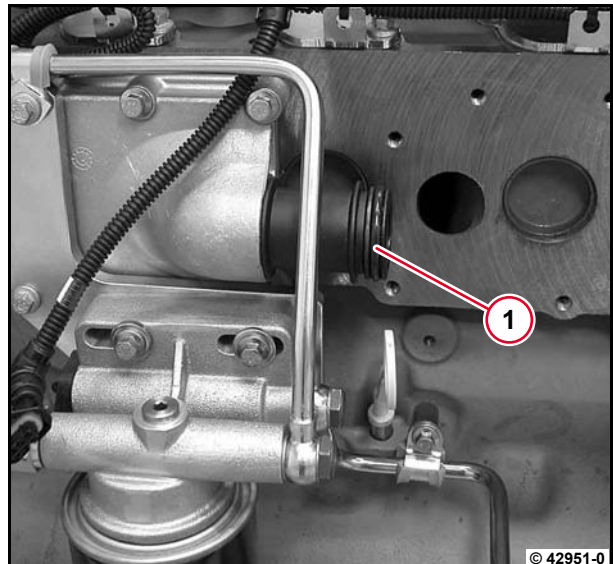
- Unscrew the screws (arrows), pull oil cooler housing (1) off plug element (2) and remove.



- Visually inspect the components.



- Pull out plug element (1).

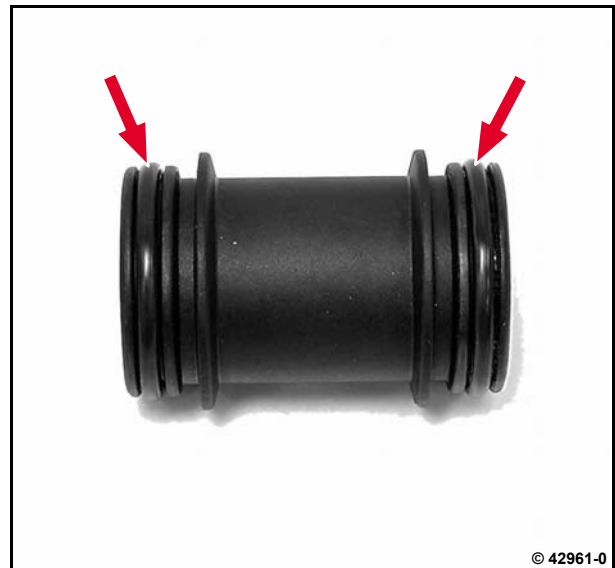


- Visually inspect the plug element.



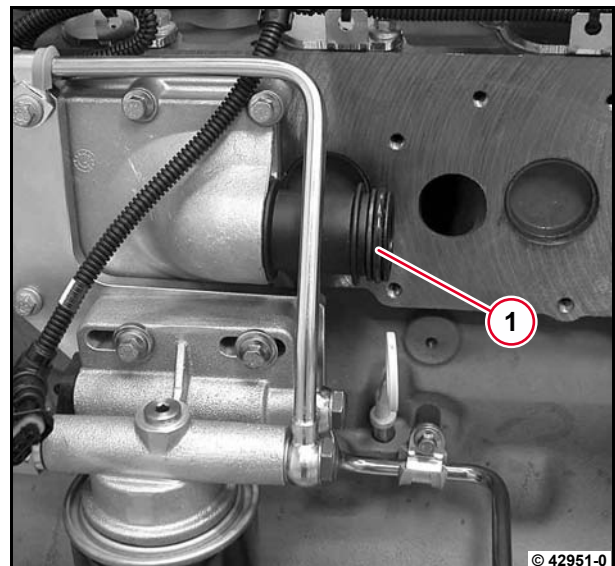
Installing the oil cooler housing

- Clean the sealing surface on the oil cooler housing and crankcase.
- Coat new round sealing rings (arrows) with fitting compound and pull onto plug element.

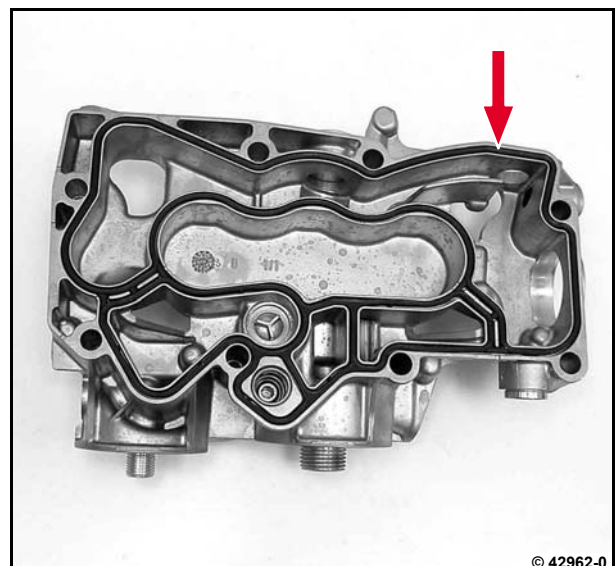


6

- Attach plug element (1) to water cistern.



- Coat new O-ring (arrow) with fitting compound and insert.



- Plug oil cooler housing to plug element and fasten screws alternately.



Attention!

Do not trap the cable (arrow) when mounting the oil cooler housing.



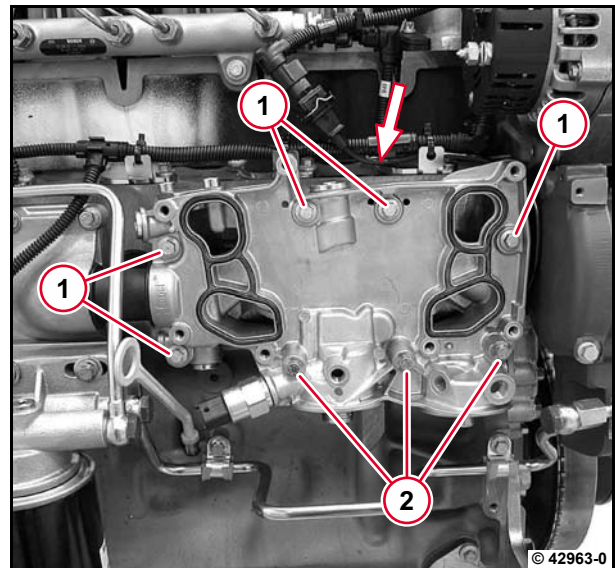
Note different screw length:

- screws M8 x 50 mm (1)
- screws M8 x 80 mm (2).

- Tighten screws.



A08 051



- Plug cable plug (1) into the oil pressure sensor.



Ensure that the connection is perfect.

- Mount oil filter cartridge.

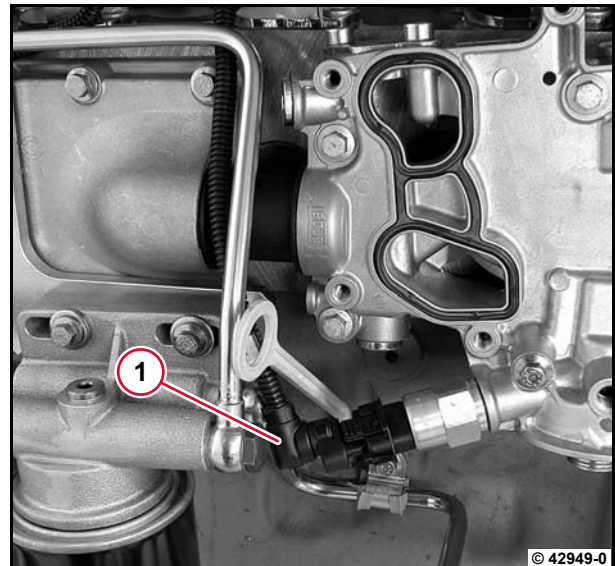


W 08-10-06

- Mount oil cooler.



W 13-08-01



Removing and installing the oil filter cartridge



Commercial available tools

Special tools:

– Special wrench 170 050



Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the oil filter cartridge

- Unscrew oil filter cartridge (1) with special wrench.



Installing the oil filter cartridge

- Lightly oil the sealing ring of the new oil filter cartridge.
- Screw in the oil filter cartridge hand tight.



A08 001



Removing and installing the oil pressure switch



Commercial available tools

Special tools:

- Long socket wrench set 110 700
- Stoppers/caps 170 160



– User notes

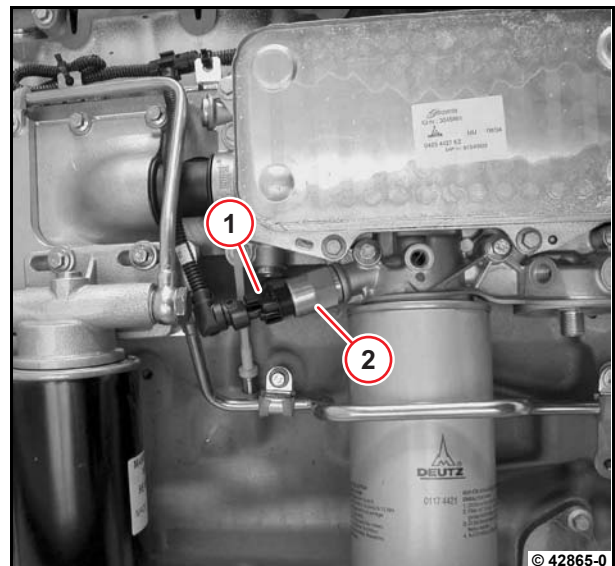


Ensure utmost cleanliness when working on the fuel system.
Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling lube oils.
Close all connections immediately after opening with new, clean stoppers/caps.
Do not remove stoppers/caps until immediately before assembling.

6

Removing the oil pressure switch

- Release cable plug (1) and pull off the fuel pressure switch (2).

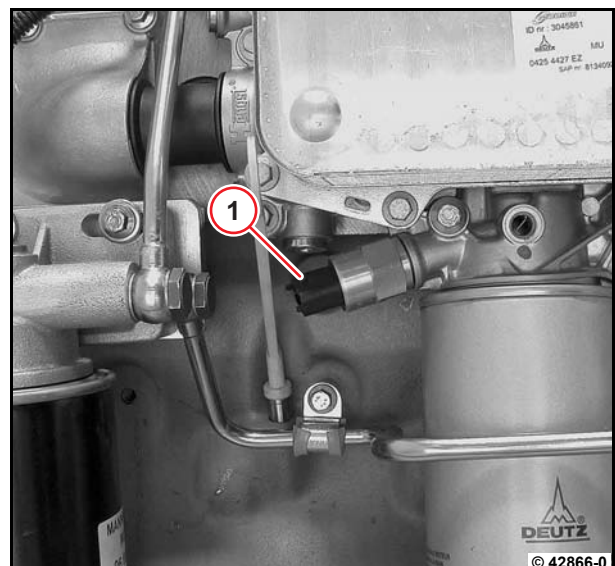


- Unscrew oil pressure switch (1).



Collect draining engine oil and dispose of according to regulations.

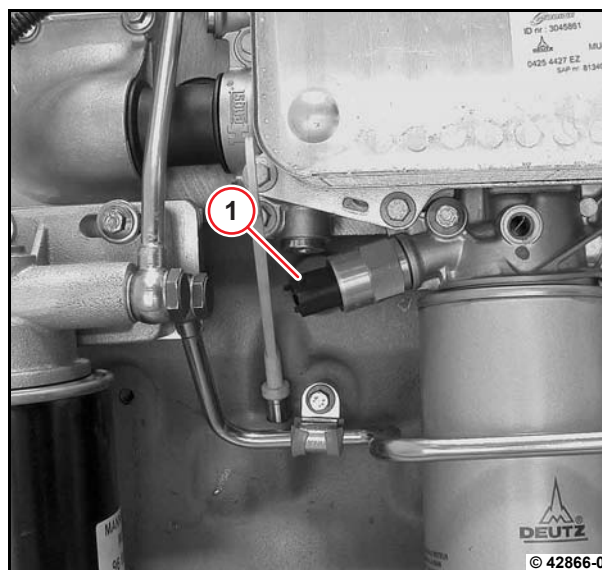
- Visually inspect the components.



Installing the oil pressure switch

- Tighten fuel pressure switch (1) with new sealing ring.

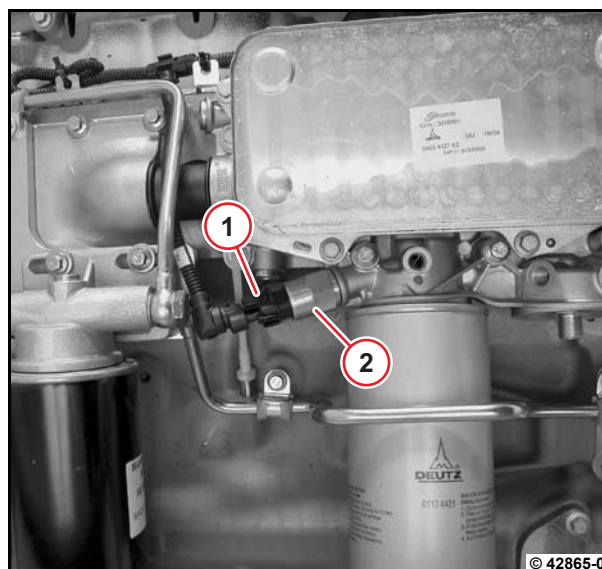
 A08 091



- Attach the cable plug (1) to the oil pressure switch (2).



Ensure that the connection is perfect.



Removing and installing the radiator tank



Commercial available tools



– Fitting compound
DEUTZ AP 1908



– W 07-10-08



Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

6

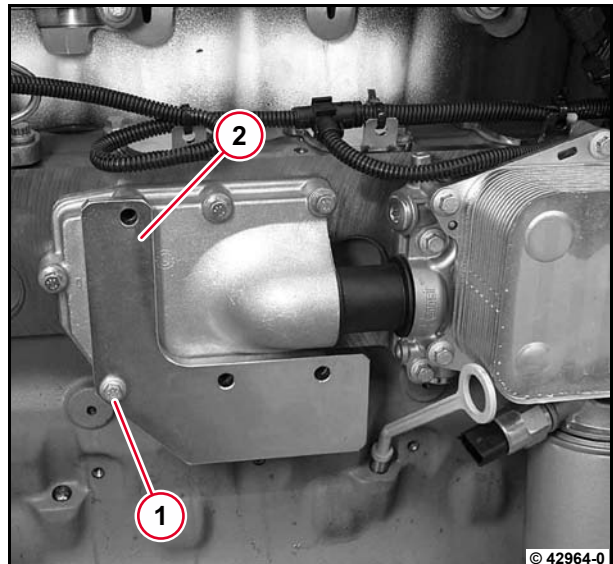
Removing the radiator tank

- Remove fuel filter console.

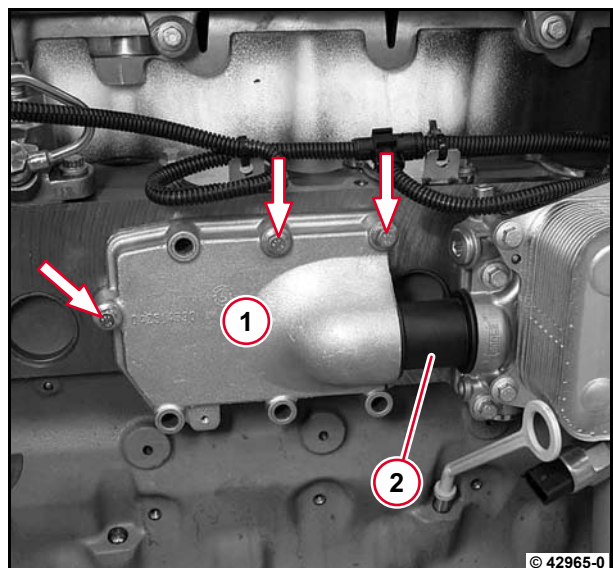


W 07-10-08

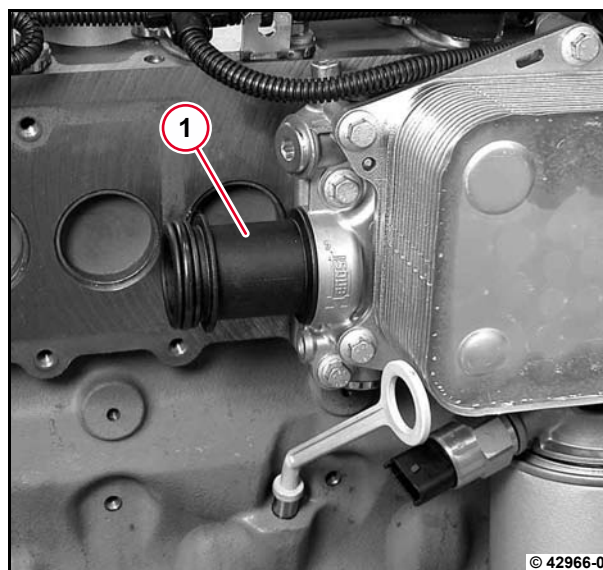
- Unscrew screw (1) and remove retaining plate (2).



- Unscrew screws (arrows), pull oil radiator tank (1) off plug element (2) and remove with gasket.



- Pull out plug element (1).
- Visually inspect the components.



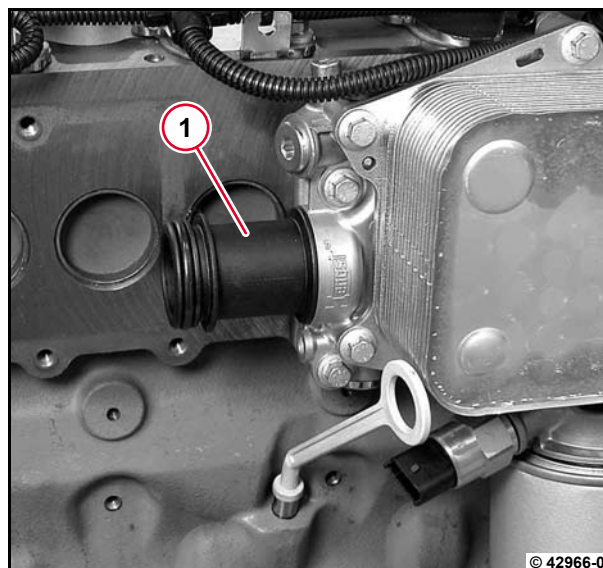
6

Installing the radiator tank

- Clean the sealing surface on the radiator tank and crankcase.
- Coat new O-rings (arrows) with fitting compound and pull onto plug element.



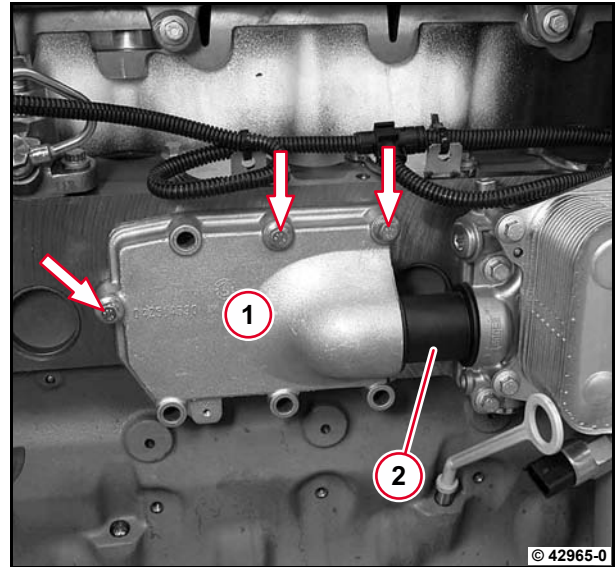
- Attach plug element (1) to oil filter holder.



- Attach radiator tank (1) to plug element (2), mount new gasket and fasten screws (arrows).



Note installation position of the gasket.
Use screws M8 x 35 mm (arrows).

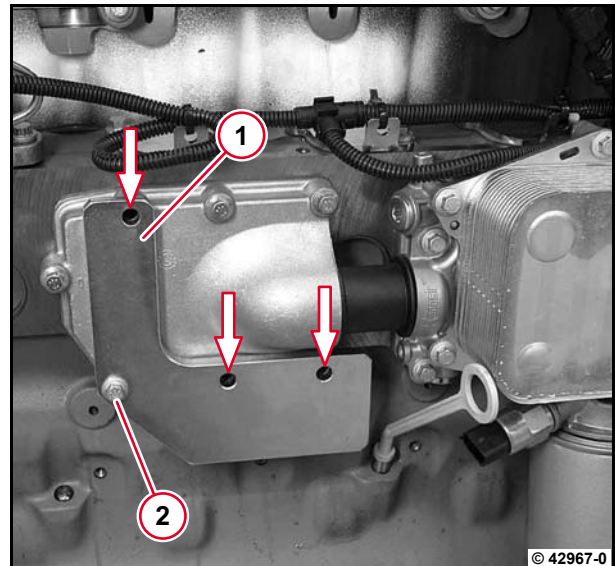


6

- Mount the retaining plate (1) and fasten the screw (2).



Use screw M8 x 45 mm (2).
The holes in the retaining plate (arrows) must be in line with the holes in the radiator tank.

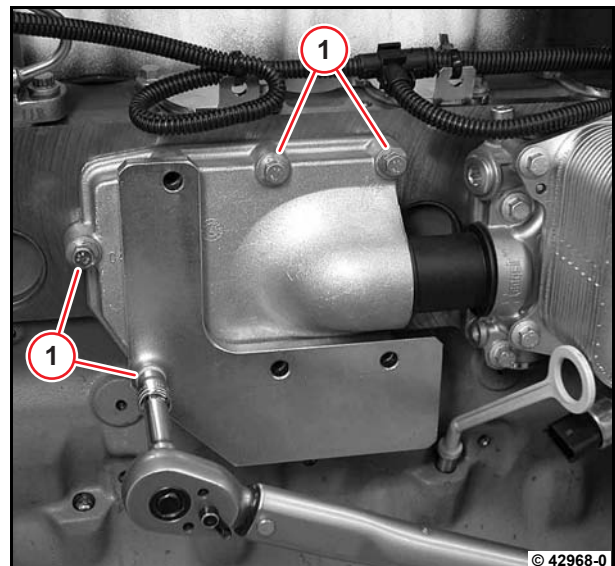


- Tighten screws (1).

 A07 087

- Install fuel filter console.

 W 07-10-08



Removing and installing the coolant pump (V-rib belt drive)



Commercial available tools



– Fitting compound
DEUTZ AP 1908



Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

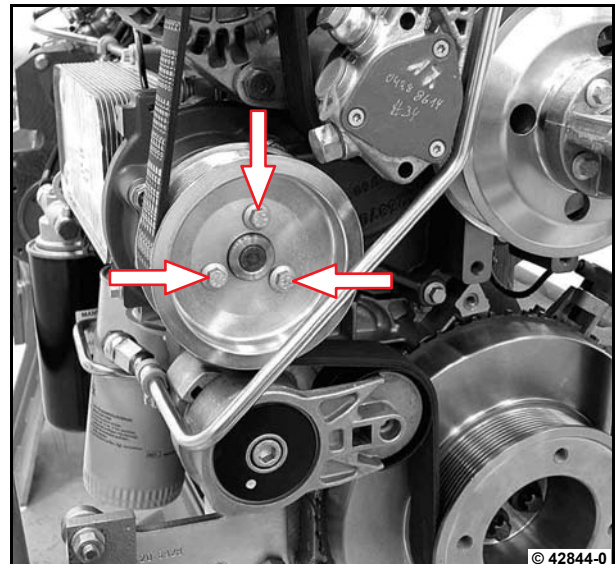
6

Removing the coolant pump

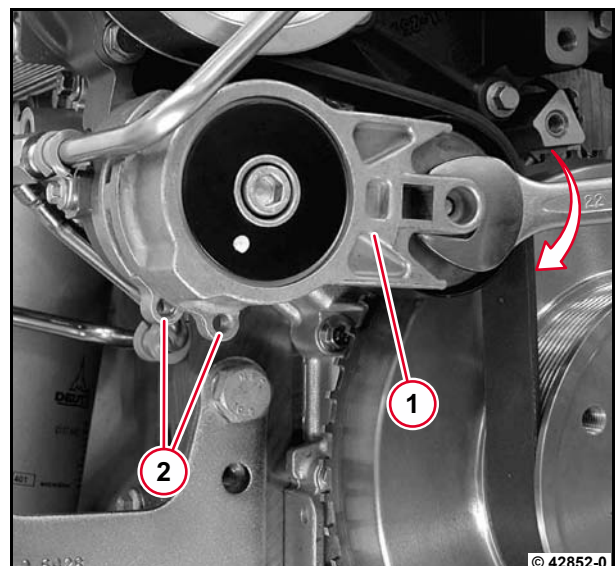
- Loosen screws (arrows).



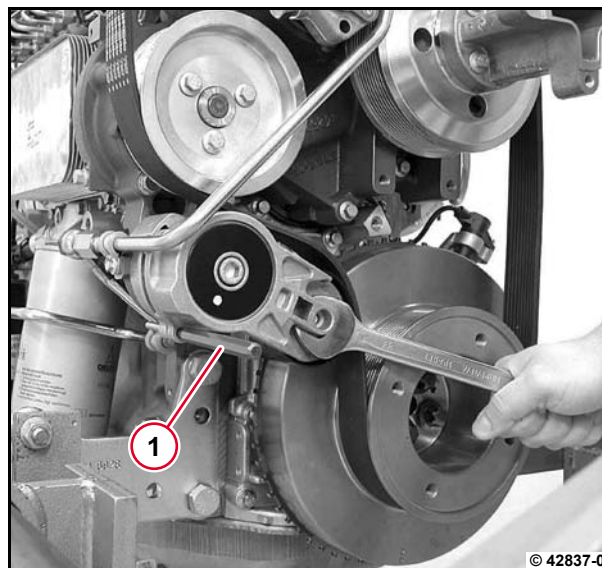
Do not unscrew screws.



- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



- Lock the belt tensioner with a suitable tool (1), e.g. mandrel 6 mm Ø.

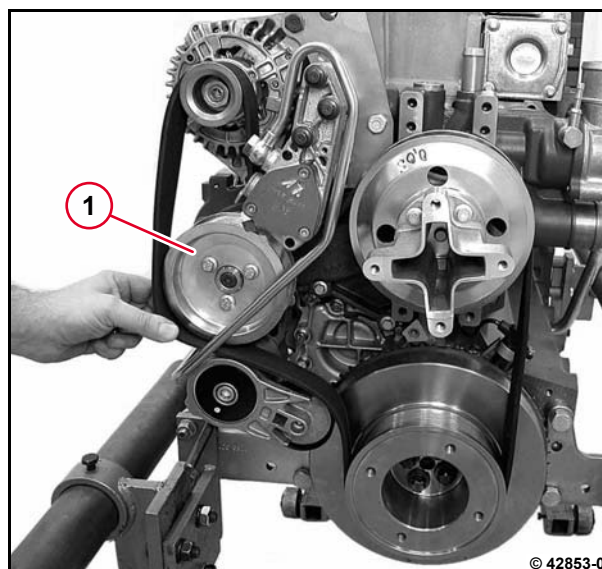


- Remove V-rib belt.

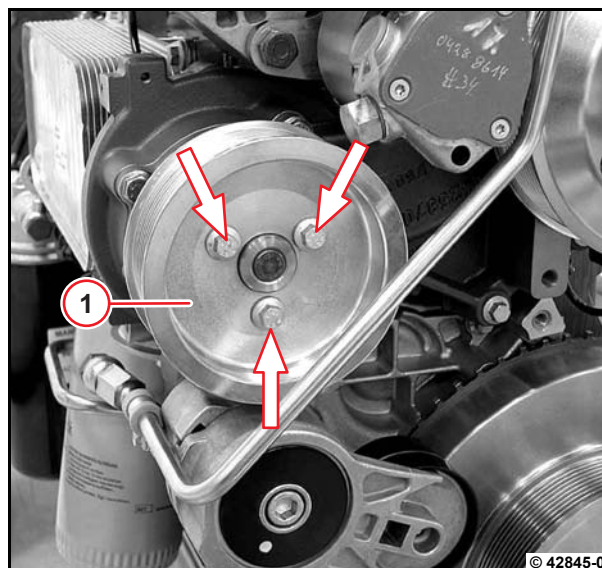


Mark the running direction when reusing the V-rib belt.

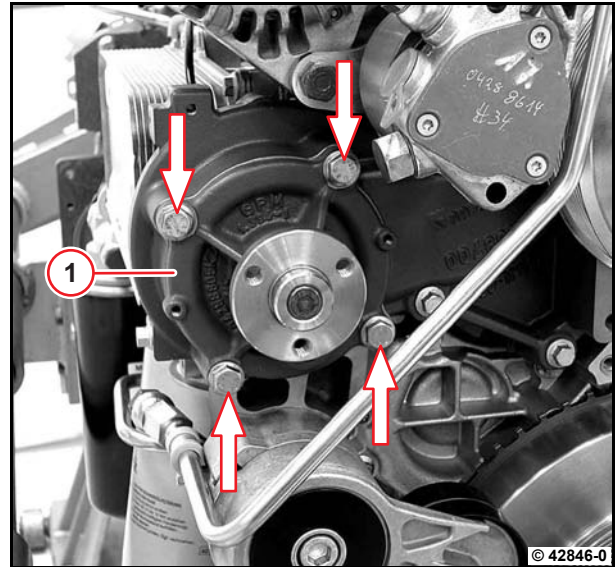
First, remove the V-rib belt from the V-rib belt pulley (1).



- Unscrew screws (arrows) and remove V-rib belt pulley (1).

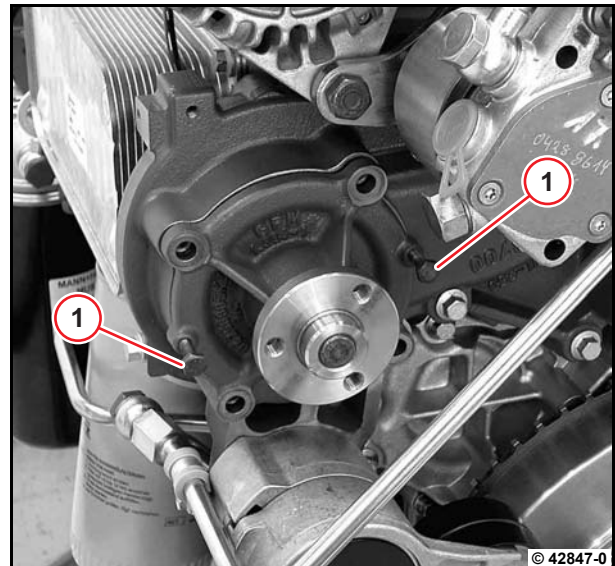


- Unscrew screws (arrows) and remove coolant pump (1).
- Visually inspect the components.



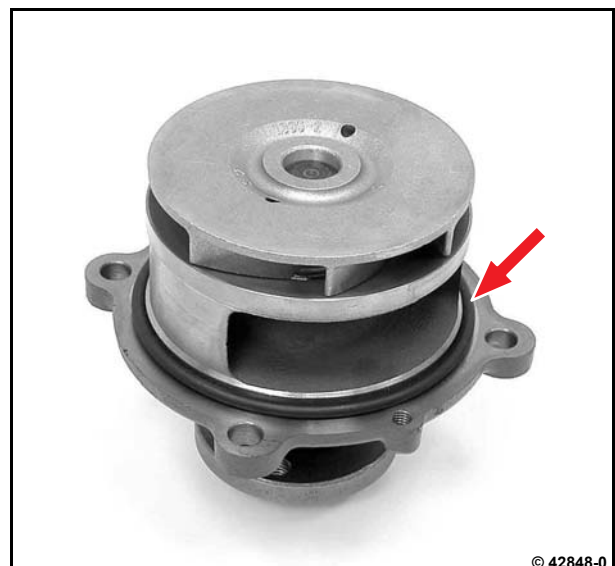
6

- Press tight coolant pump off the fan console with **2 setting screws** (1).
- Unscrew the setting screws from the coolant pump.
- Clean the sealing surface on the coolant pump and fan console.



Installing the coolant pump

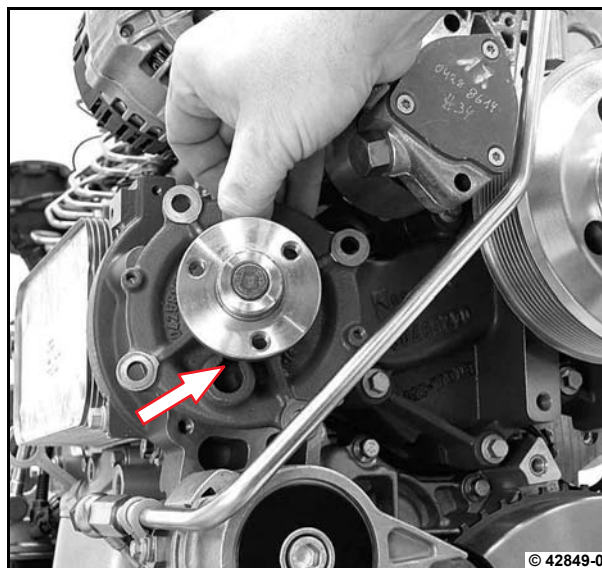
- Coat new O-ring (arrow) with fitting compound and pull on.



- Insert coolant pump.



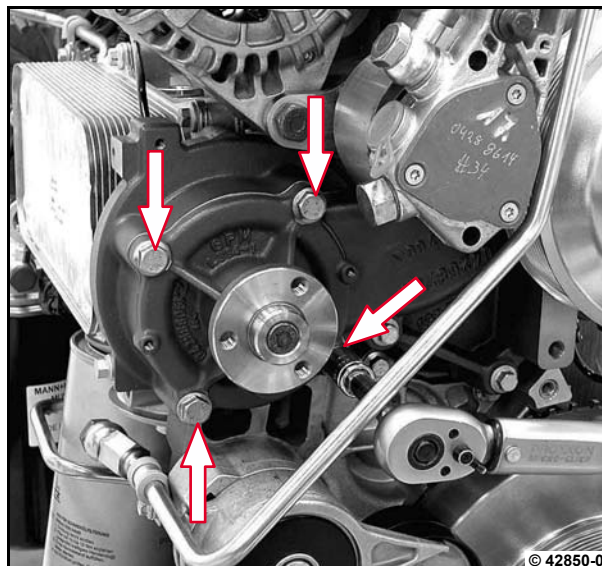
The bleed hole (arrow) must be facing the crankshaft.



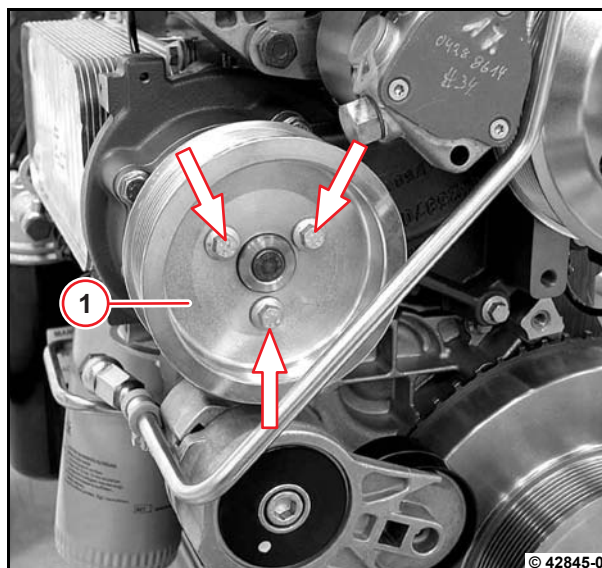
- Tighten screws (arrows) alternately.



A09 010



- Mount the V-rib belt pulley (1) and tighten the screws (arrows).

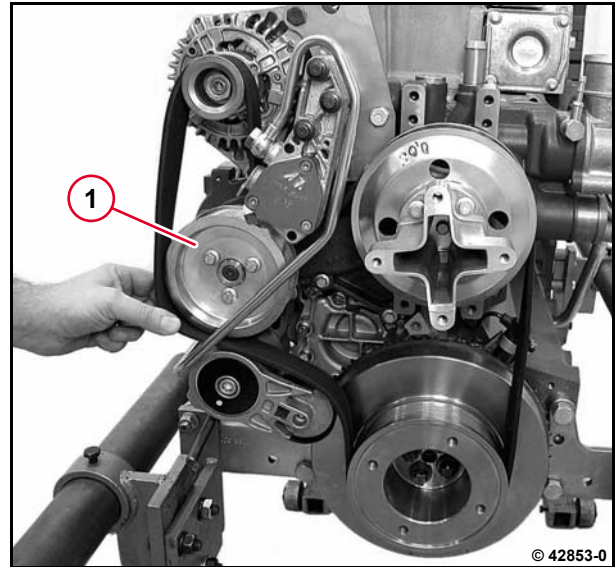


- Fit the V-rib belt according to the running direction.



Finally place the V-rib belt over the V-rib belt pulley (1).

Ensure that the installation location of the V-rib belt is free from faults.

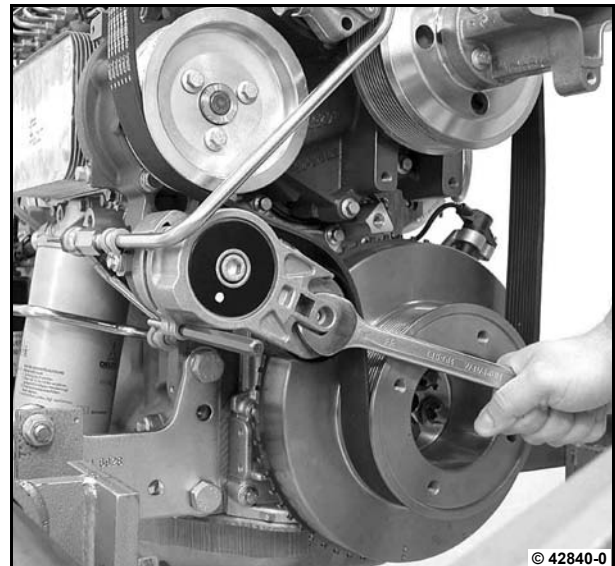


6

- Support the belt tensioner, remove the mandrel and slowly relieve the strain on the belt tensioner.



The V-rib belt is tightened automatically by the belt tensioner.



Checking the wear limit of the V-rib belt

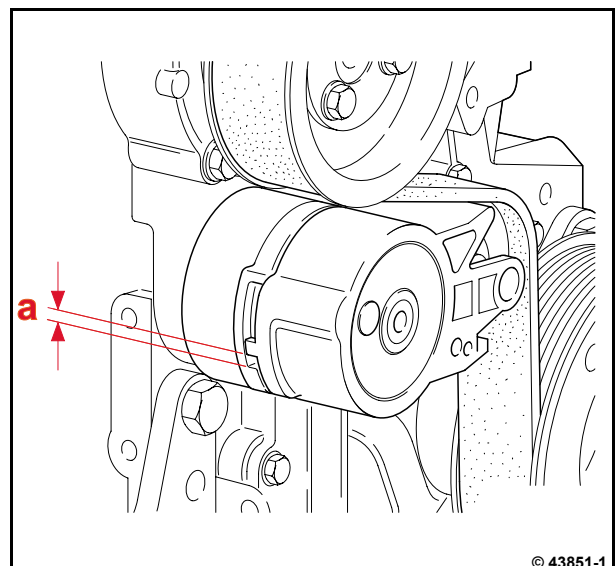


The fuel line has been removed for a better view.

- Measured distance (a).



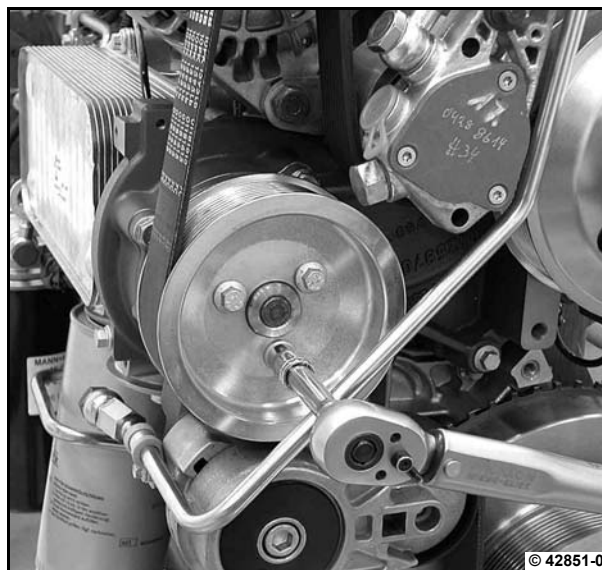
If the distance (a) is less than 3 mm, the V-rib belt must be changed.



- Tighten screws.



A09 015



Checking the coolant thermostat when uninstalled



Commercial available tools:
– Thermometer



– W 09-08-02



Danger!

Risk of injury! Hot water and hot thermostat.

6

Checking the coolant thermostat

- Remove the coolant thermostat.

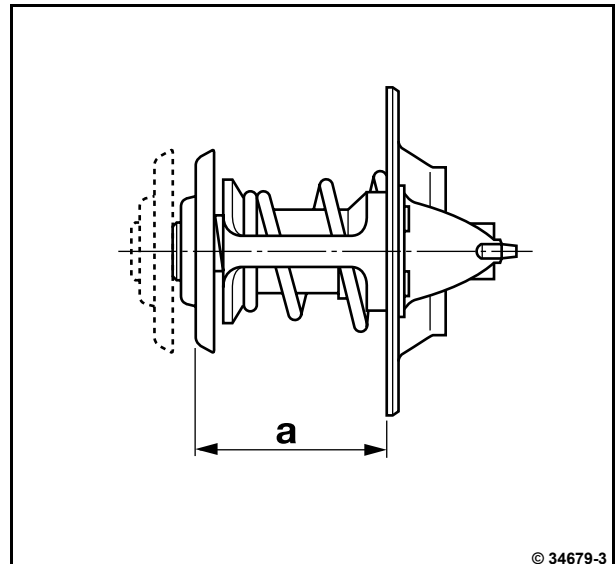


W 09-08-02

- Measure dimension (a), between start and end of stroke on the thermostat.



P09 11

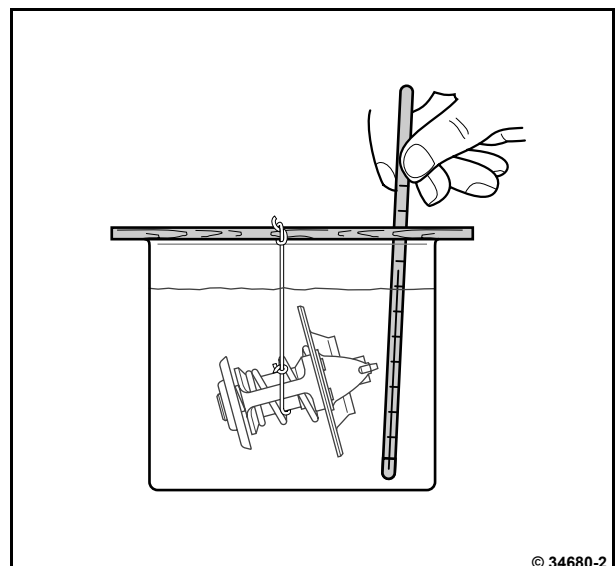


- Heat up the coolant thermostat in the water bath.



In order to determine the exact beginning of opening, the temperature should be measured as close as possible to the thermostat without touching it.

The water should be continuously stirred for an even temperature distribution. The temperature rise should not take place faster than 1°C/min. Otherwise the beginning of opening will be delayed accordingly.



- Measure dimension (b) on the thermostat.



P09 13

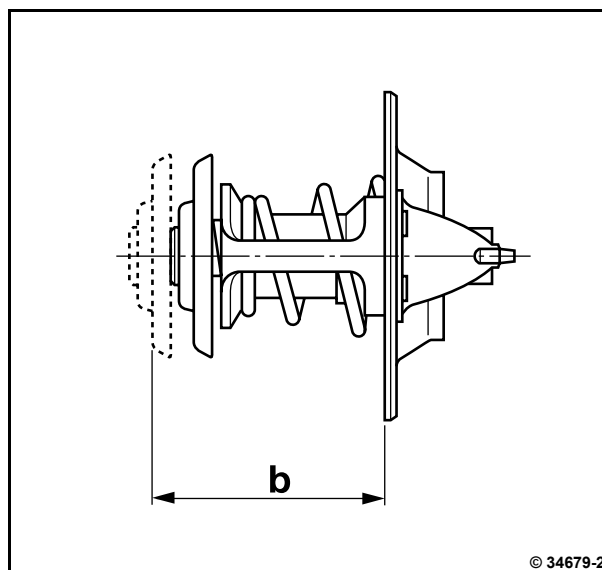


Stroke distance at given temperature (T2)
at least 8 mm.

- Install the coolant thermostat.



W 09-08-02



Removing and installing the coolant thermostat



Commercial available tools



– Fitting compound
DEUTZ AP 1908

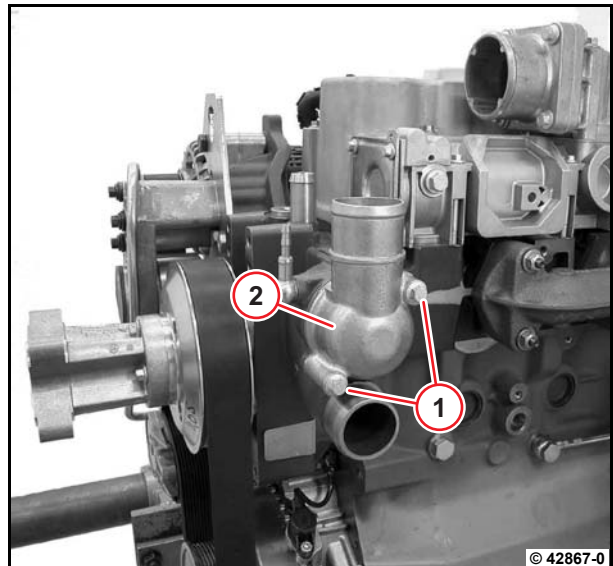


Collect leaking operating substances in suitable vessels and dispose of according to regulations.

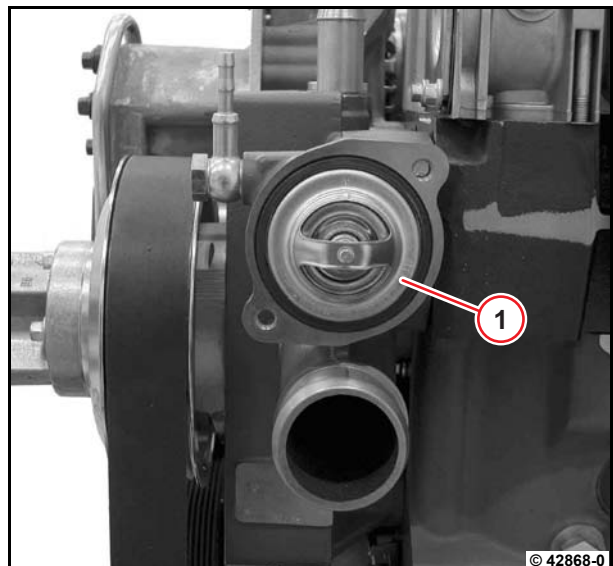
6

Removing the coolant thermostat

- Unscrew screws (1) and remove coolant outlet nozzle (2).

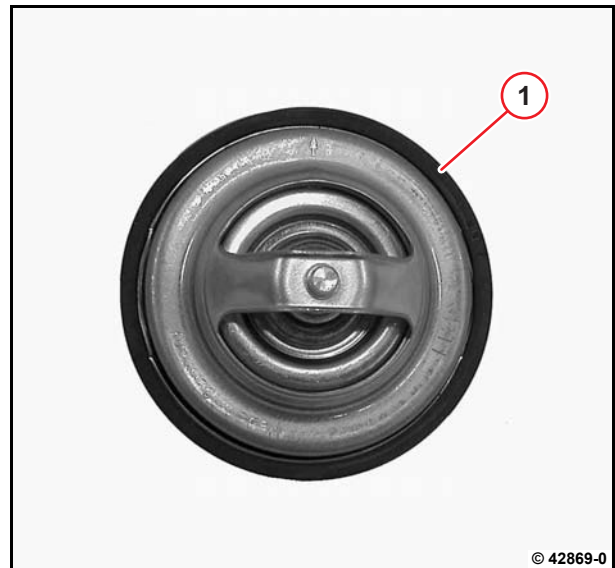


- Remove coolant thermostat (1).
- Visually inspect the components.



Installing coolant thermostat

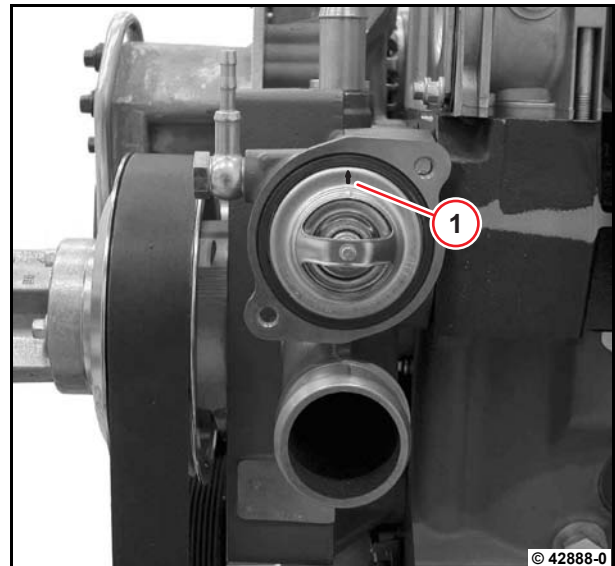
- Clean the sealing surface on the coolant outlet nozzle and fan console.
- Coat new sealing ring (1) with assembly aid and pull on.



- Insert coolant thermostat.



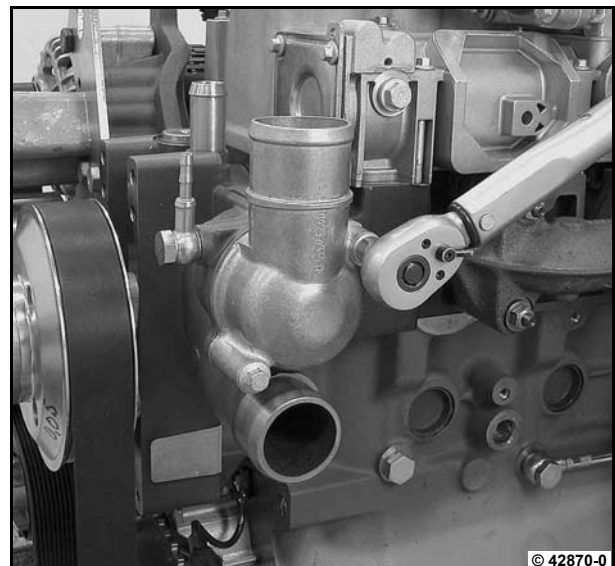
The arrow (1) must point upwards.



- Mount coolant outlet nozzle and tighten screws.



A09 002



Remove and install coolant temperature sensor



Commercial available tools



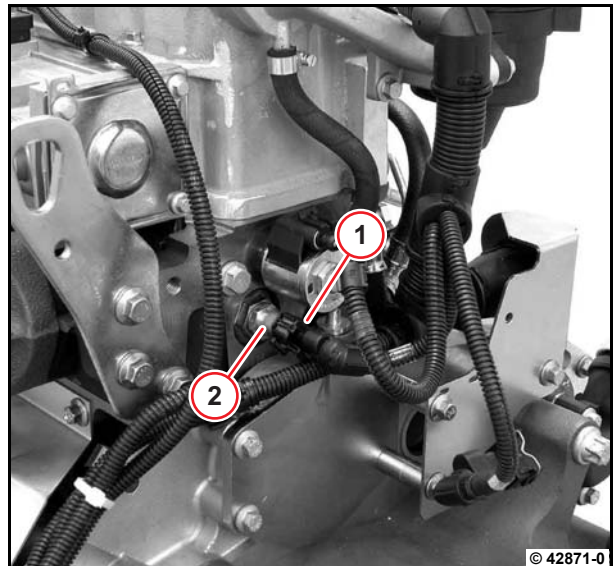
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

The relevant documentation from the vehicle manufacturer must be observed when emptying and filling the cooling system.

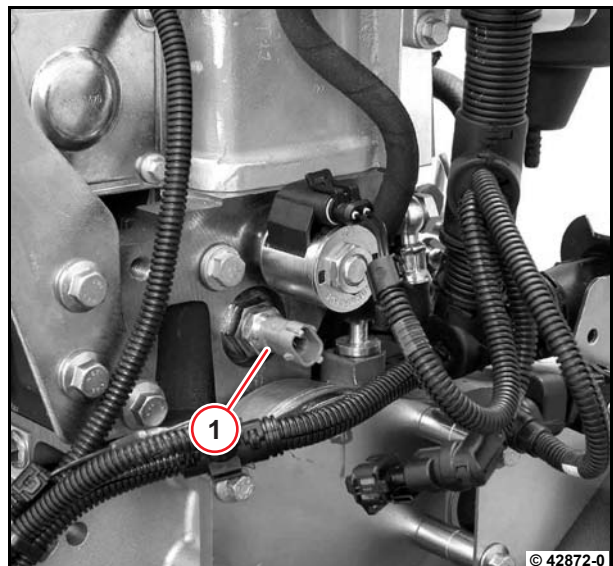
6

Removing the coolant temperature sensor

- Release cable plug (1) and pull off from the coolant temperature sensor (2).



- Unscrew coolant temperature sensor (1).
- Visually inspect the components.



Installing the coolant temperature sensor

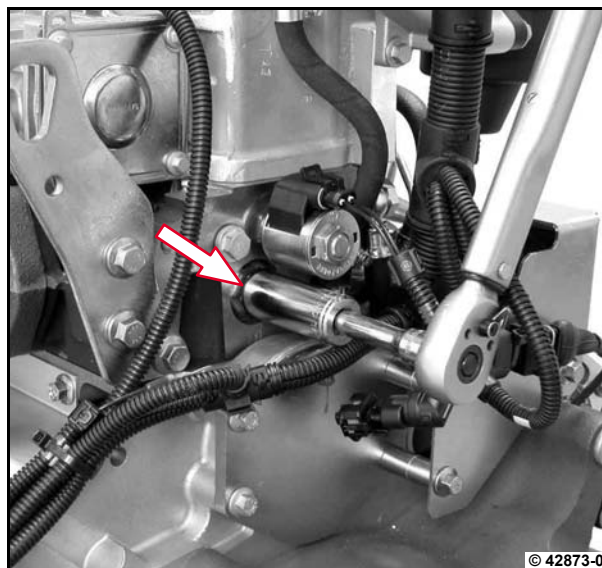
- Screw the coolant temperature sensor (arrow) tight.



A09 031



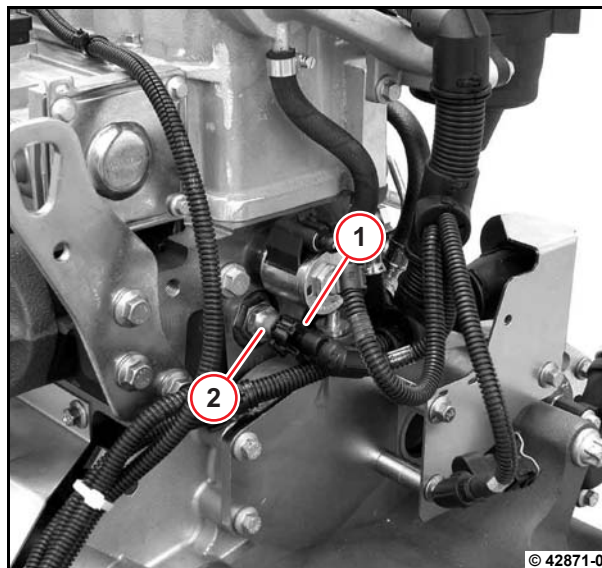
Make sure the sealing ring is in place.



- Plug the cable plug (1) into the coolant temperature sensor (2).



Ensure that the connection is perfect.



Dismantling and assembling the fan drive



Commercial available tools



– W 09-13-02

6

Dismantling the fan drive

- Remove the fan drive.

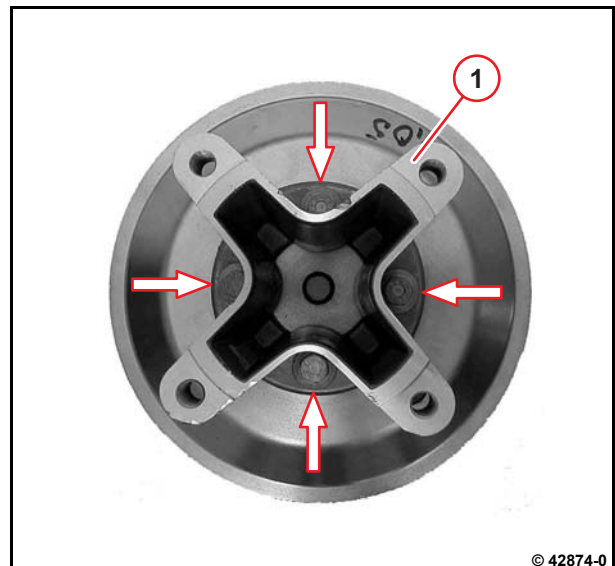


W 09-13-02

- Mount the adapter (1) and tighten the screws (arrows).



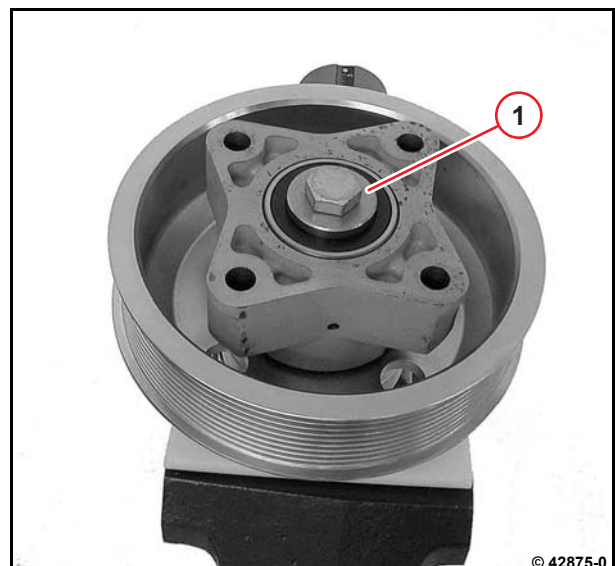
A09 048



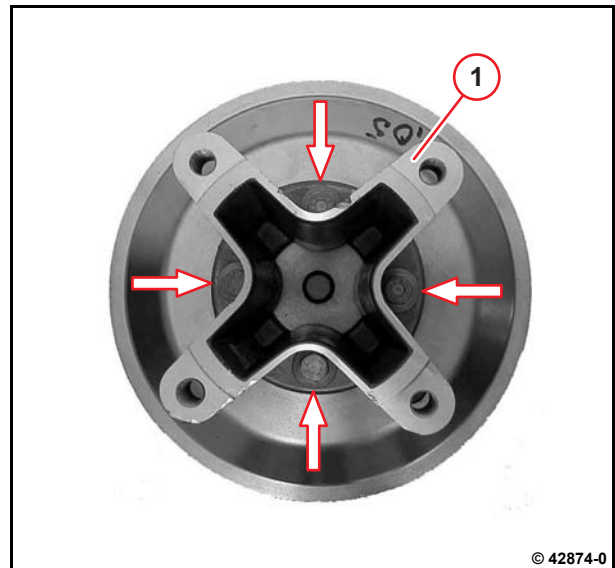
- Clamp the fan drive in the vice.
- Unscrew screw (1).



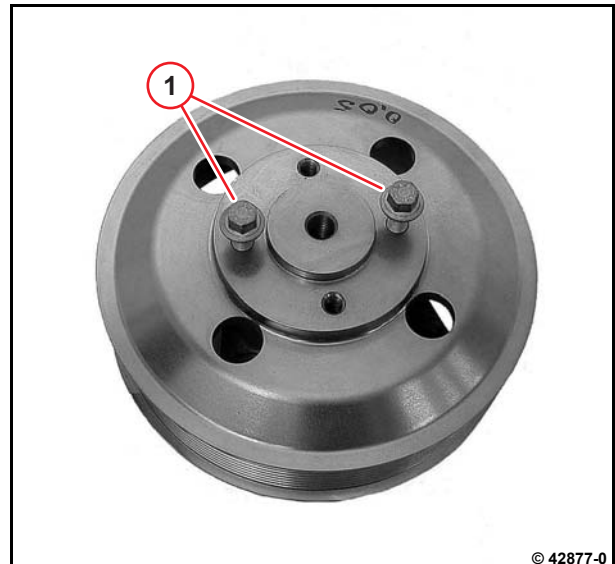
Left-hand thread.



- Unclamp fan drive.
- Unscrew screws (arrows) and remove adapter (1).



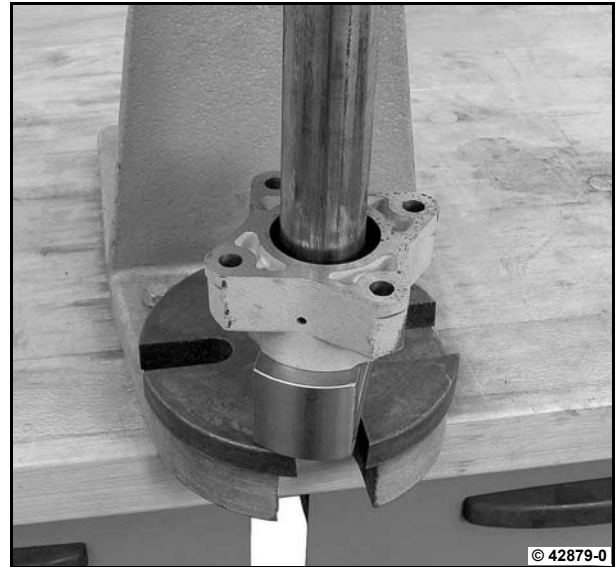
- Press tight V-rib belt pulley off the fan drive with 2 setting screws (1).



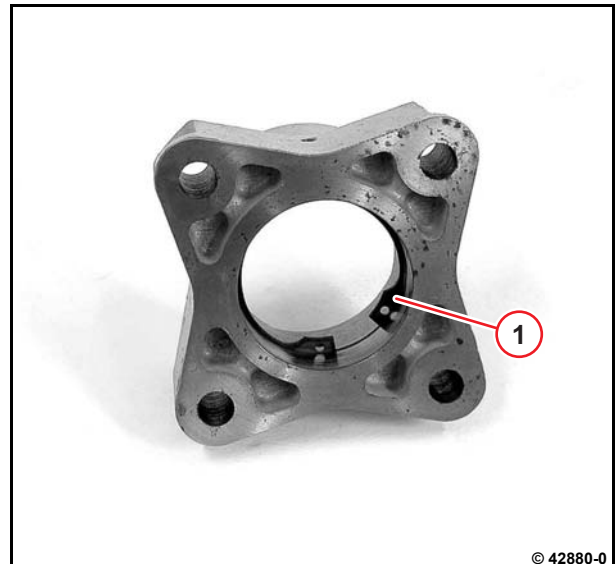
- Press out shaft with internal ball bearing.



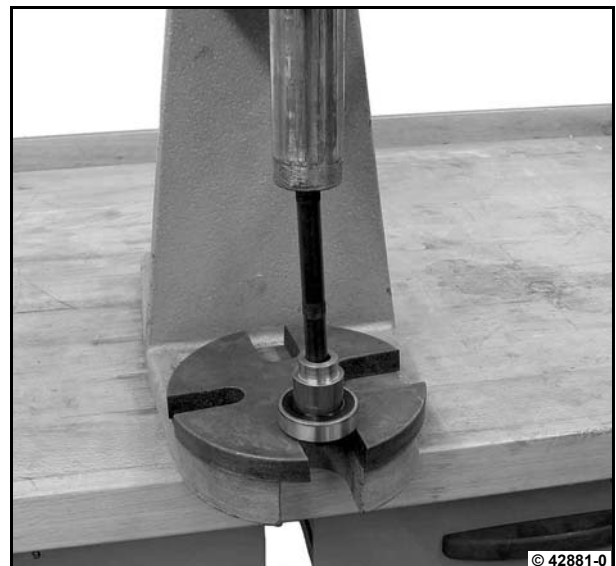
- Press out outside ball bearing.

**6**

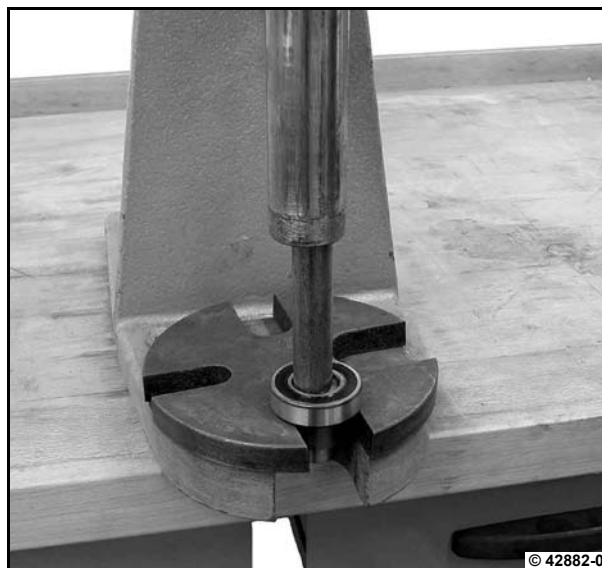
- Remove circlip (1).



- Press the disc out of the inside ball bearing.



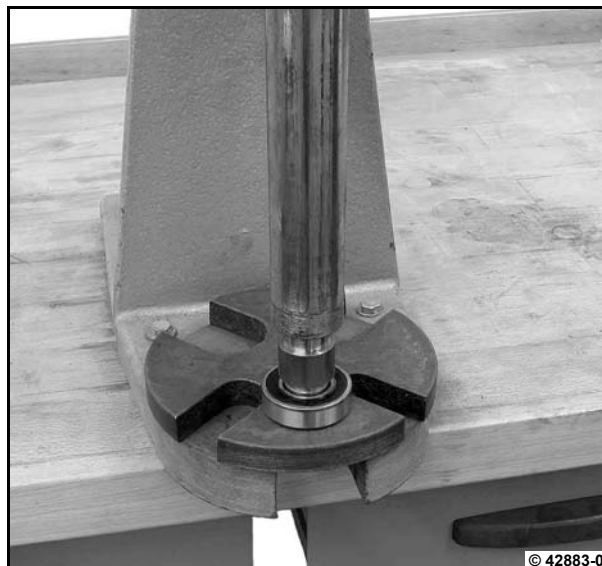
- Press the shaft out of the inside ball bearing.
- Visually inspect the components.



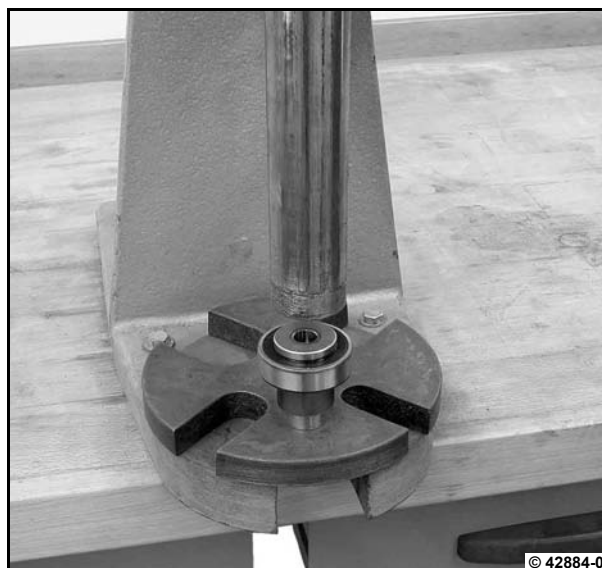
6

Assembling the fan drive

- Press the shaft into the inside ball bearing to the stop.



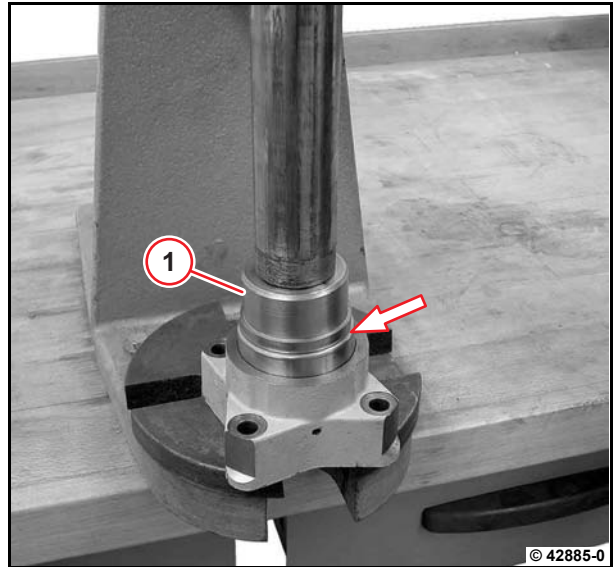
- Press the shaft into the inside ball bearing to the stop.



- Press the outer ball bearing into the housing to the stop.



The press-in tool (1) must be applied to the outer ring of the ball bearing (arrow).

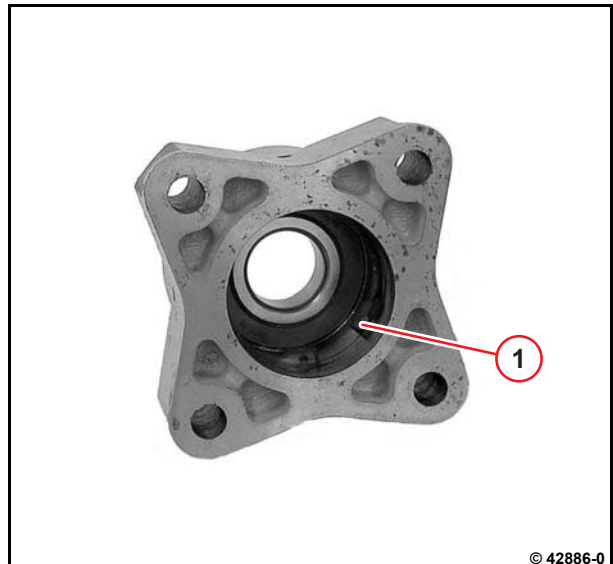


6

- Insert circlip (1).



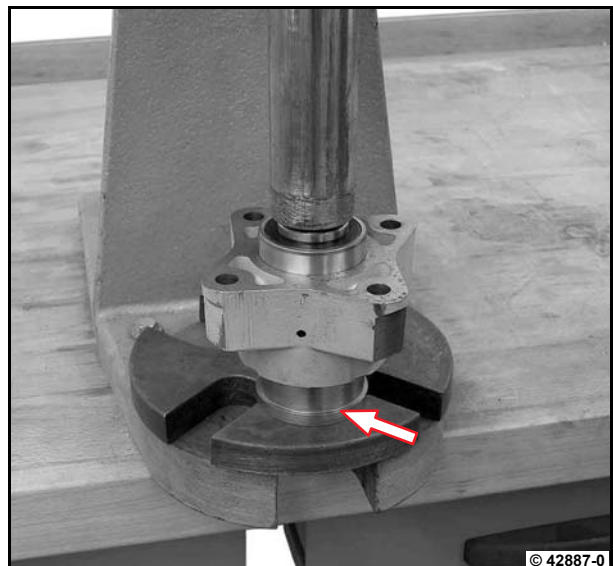
Make sure the circlip fits correctly in the groove.



- Press the shaft with inside ball bearing in to the stop.

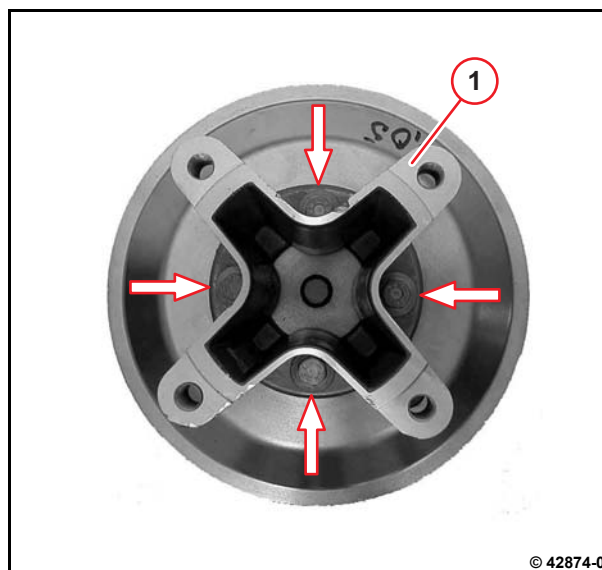


Support the inside ring of the outer ball bearing with a suitable tool (arrow).



- Mount the adapter (1) and tighten the screws (arrows).

 A09 048

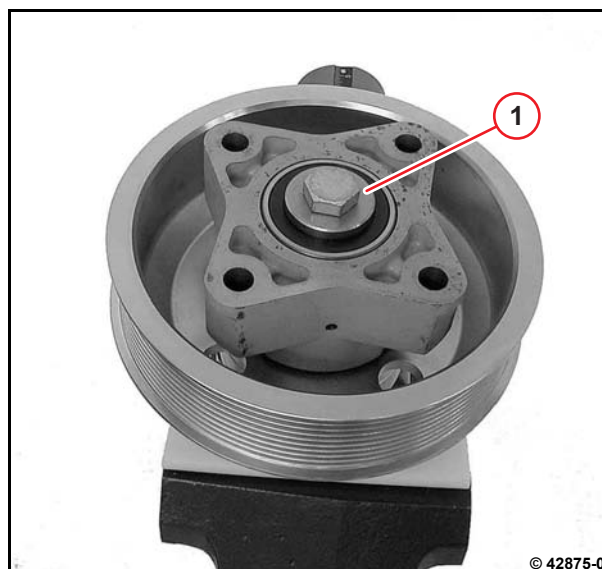


- Clamp the fan drive in the vice.
- Mount the fan drive on the V-rib belt pulley and tighten the screw (1).

 A09 047

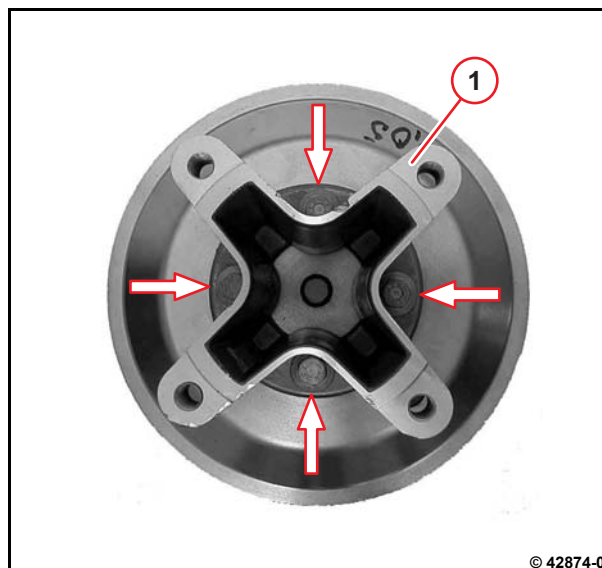


Left-hand thread.



- Unclamp fan drive.
- Unscrew screws (arrows) and remove adapter (1).
- Install fan drive.

 W 09-13-02



Removing and installing the fan drive

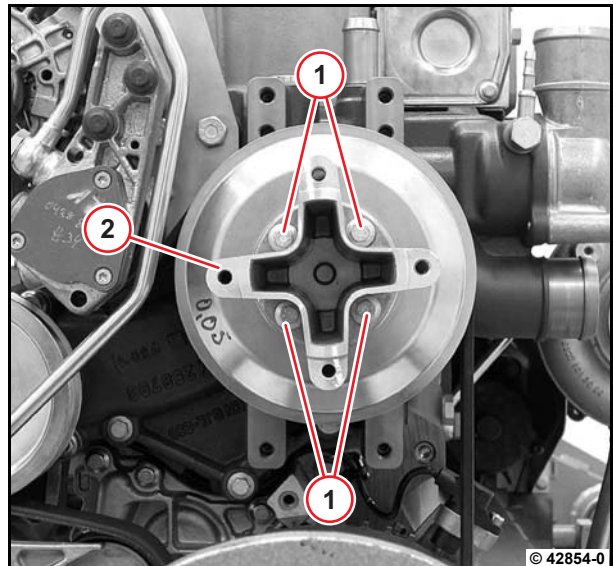


Commercial available tools:
– Mandrel 6 mm Ø

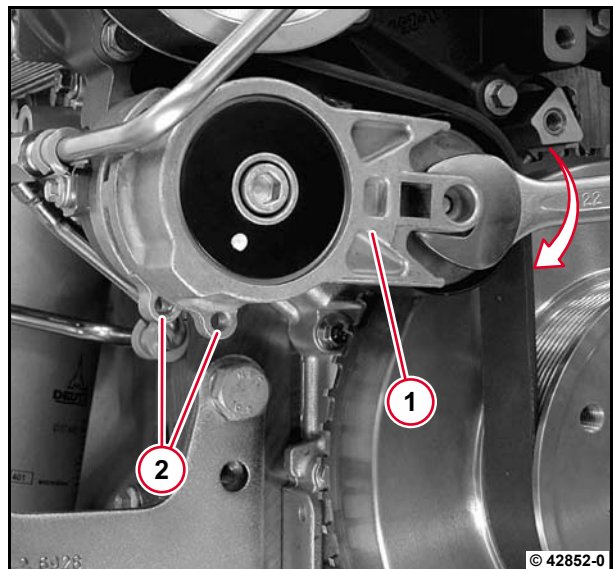
6

Removing the fan drive

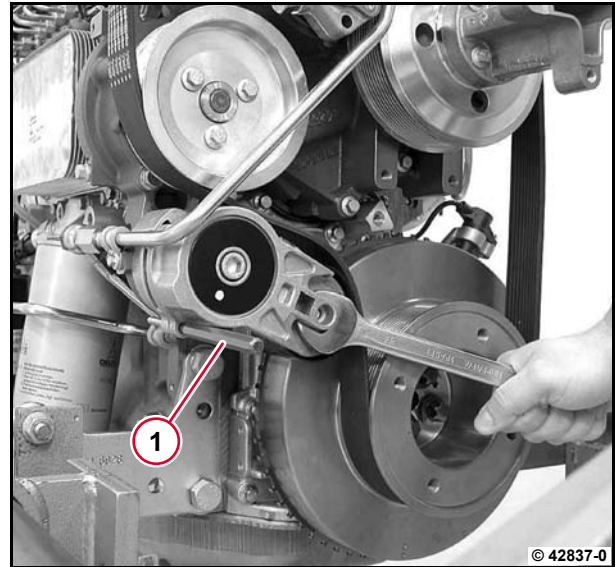
- Unscrew screws (1) and remove adapter (2).



- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



- Lock the belt tensioner with a suitable tool (1), e.g. mandrel 6 mm Ø.

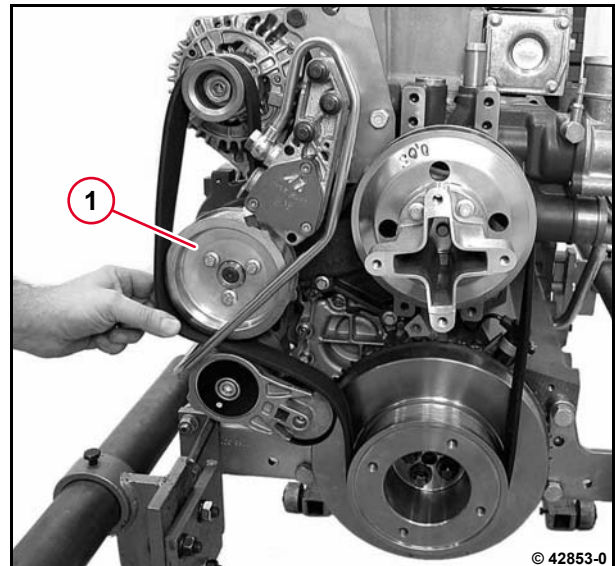


- Remove V-rib belt.



Mark the running direction when reusing the V-rib belt.

First remove the V-rib belt from the V-rib belt pulley (1).

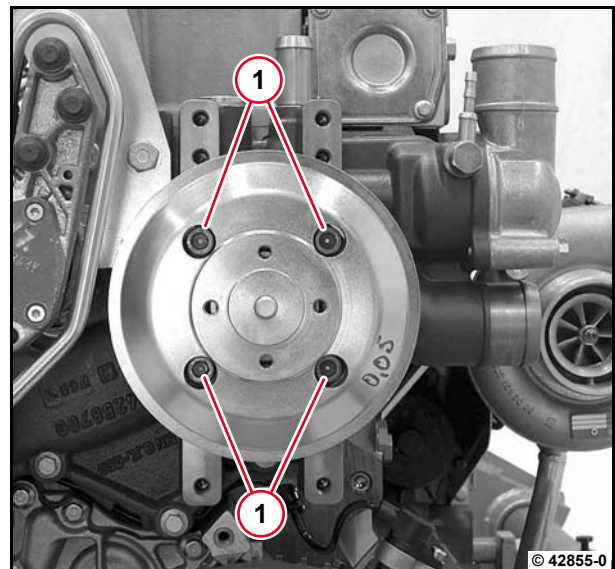


- Unscrew screws (1) and remove fan drive with V-rib belt pulley.



Note installation position of the fan drive.

- Visually inspect the components.



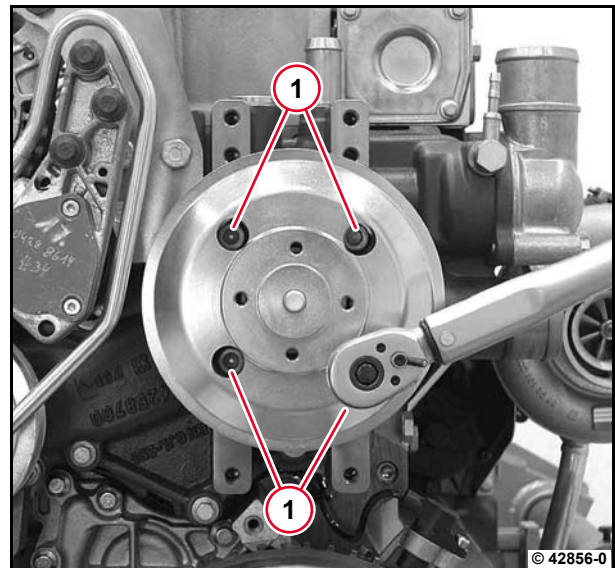
Mount fan drive

- Mount the fan drive with V-rib belt pulley and tighten the screws (1).

 A09 046



Note installation position of the fan drive.



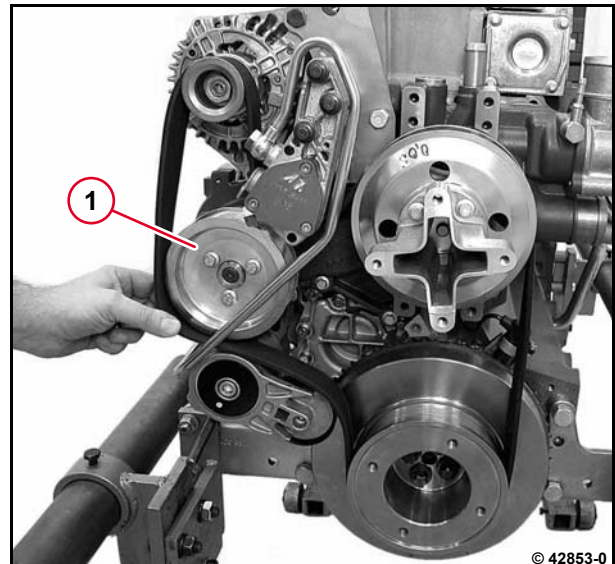
6

- Fit the V-rib belt according to the running direction.



Finally place the V-rib belt over the V-rib belt pulley (1).

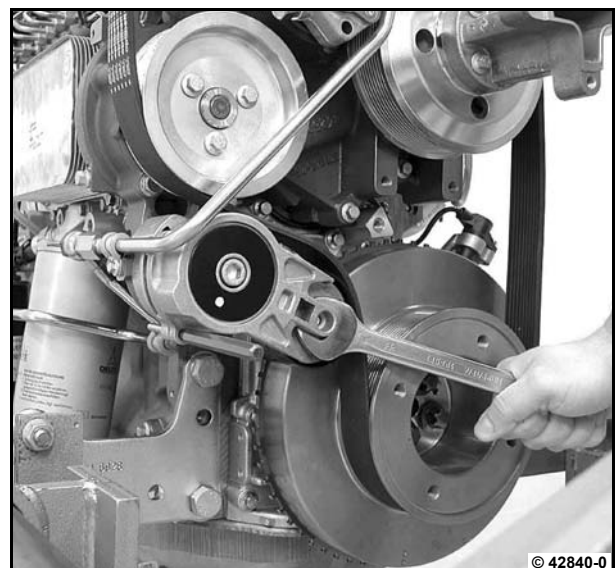
Ensure that the installation location of the V-rib belt is free from faults.



- Hold the belt tensioner, remove the mandrel and slowly relieve the strain on the belt tensioner.



The V-rib belt is tightened automatically by the belt tensioner.



Checking the wear limit of the V-rib belt

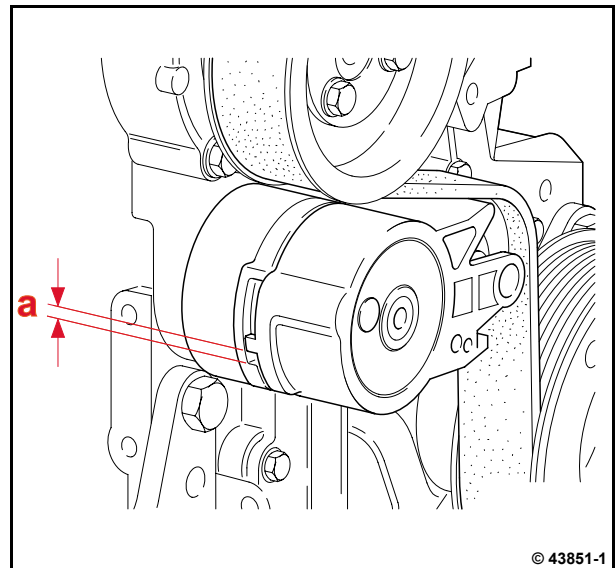


The fuel line has been removed for a better view.

- Measured distance (a).



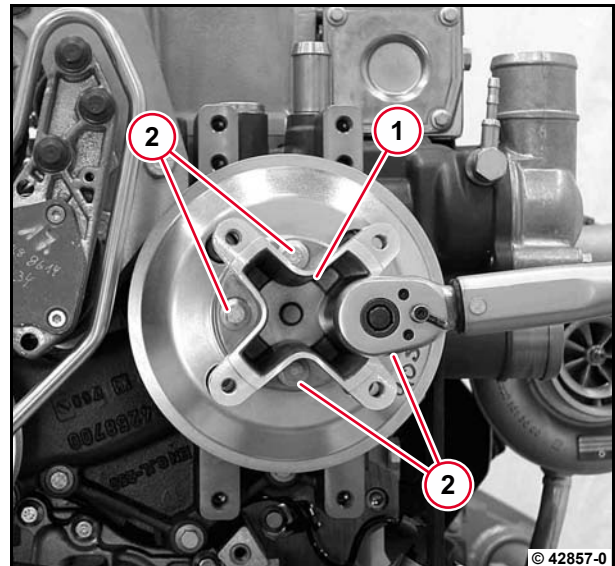
If the distance (a) is less than 3 mm, the V-rib belt must be changed.



- Mount the adapter (1) and tighten the screws (2).



A09 048



Removing and installing the fan console



Commercial available tools



- Fitting compound
DEUTZ AP 1908
- Sealant DEUTZ DW 74



- W 07-11-01
- W 09-13-02
- W 12-02-06
- W 13-02-03



Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the fan console

- Remove the fan drive.

 W 09-13-02

- Remove the belt tensioner (V-rib belt).

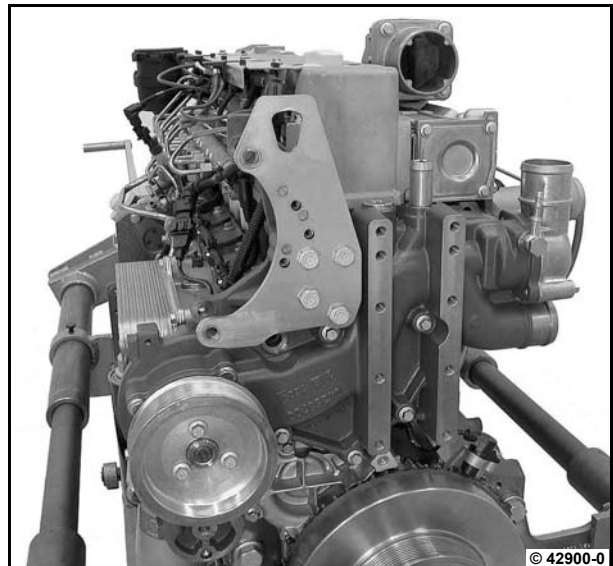
 W 12-02-06

- Remove the fuel supply pump.

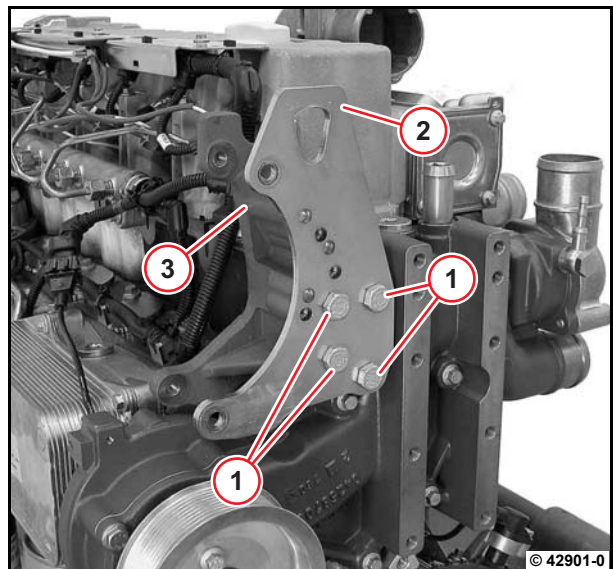
 W 07-11-01

- Remove the generator (V-rib belt).

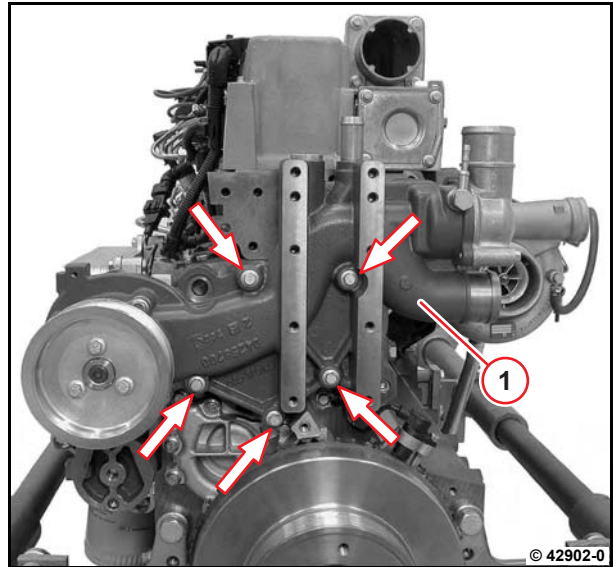
 W 13-02-03



- Unscrew screws (1) and remove transport flange (2) and generator console (3).

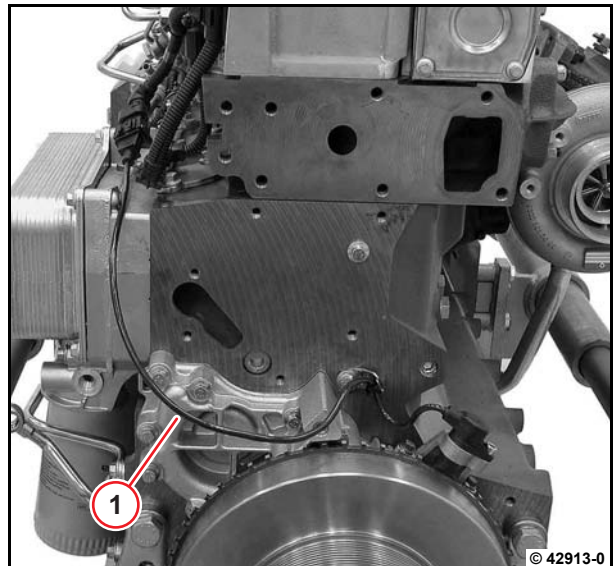


- Unscrew screws (arrows) and remove fan console (1).

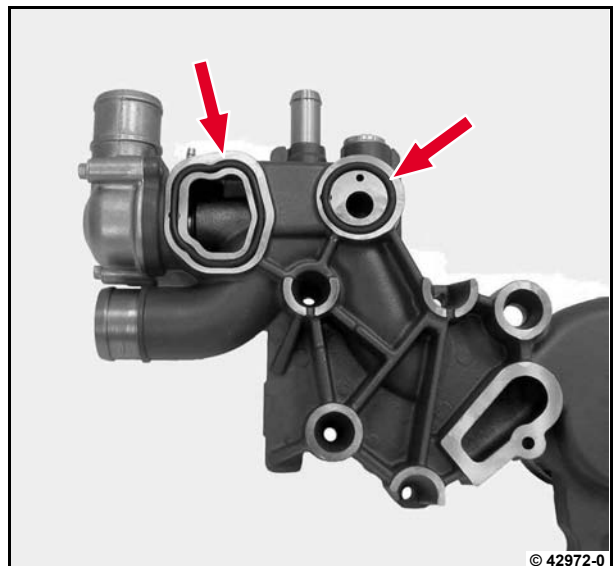


Installing the fan console

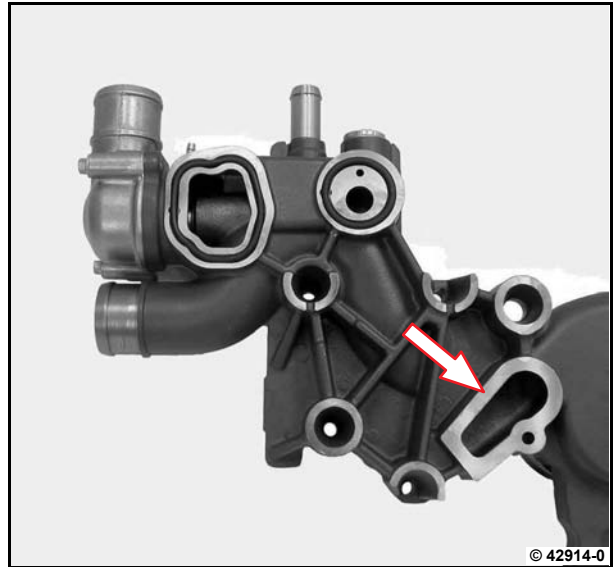
- Pull the cable (1) forward slightly.



- Clean the sealing surfaces on the fan console, cylinder head and crankcase.
- Coat new O-rings (arrows) with fitting compound and insert.



- Apply sealant to fan console (arrow).



- Mount fan console and tighten screws (arrows).



A09 045



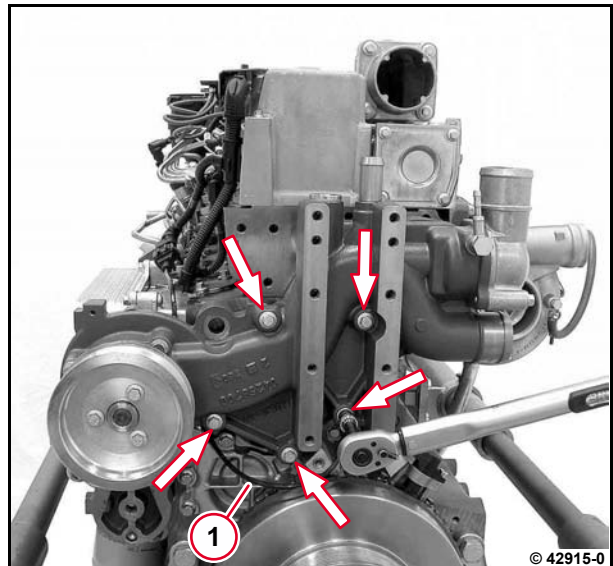
Attention!

Do not trap the cable (1) when mounting the fan console.



Do not move the sealant when mounting the fan console.

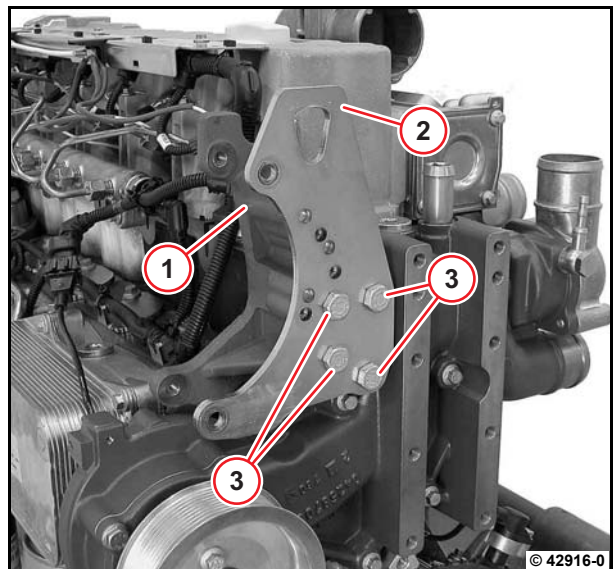
- Lay the cable between the front cover and the fan console.



- Mount generator console (1) and remove transport flange (2) and screws (3).



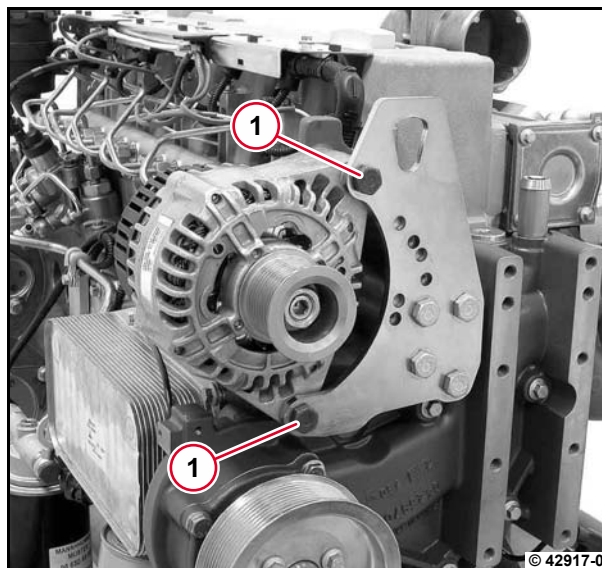
Do not tighten screws.



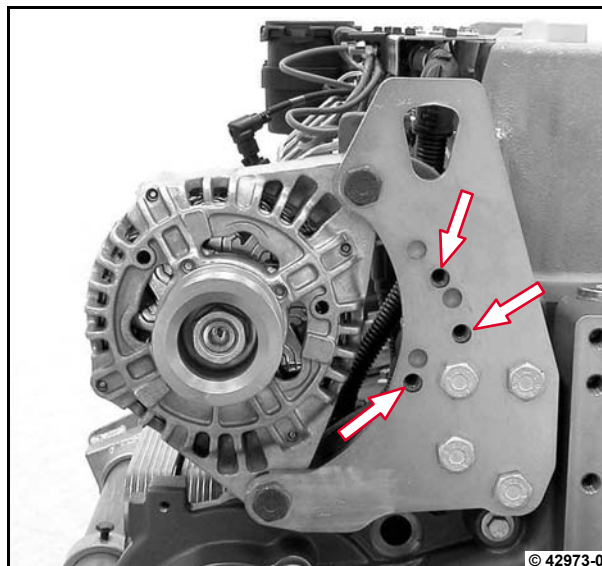
- Insert generator and fasten screws (1).



Do not tighten screws.



The holes in the transport flange (arrows) must be in line with the threaded holes in the generator console.



- Tighten screws (1).

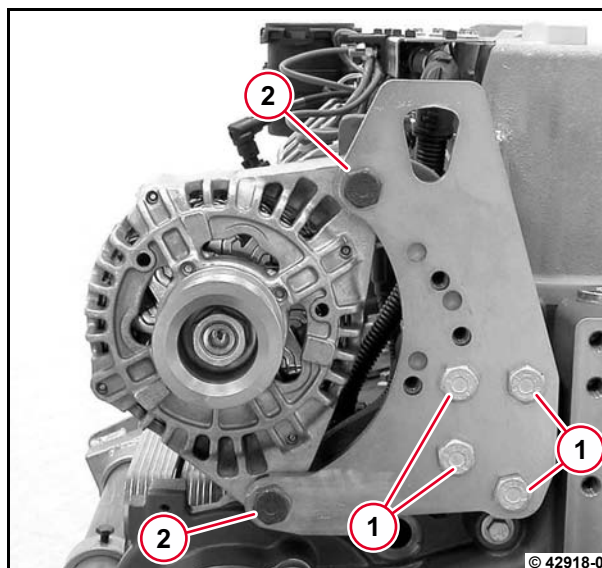


A13 018

- Tighten screws (2).



A13 012



- Mount fuel supply pump.

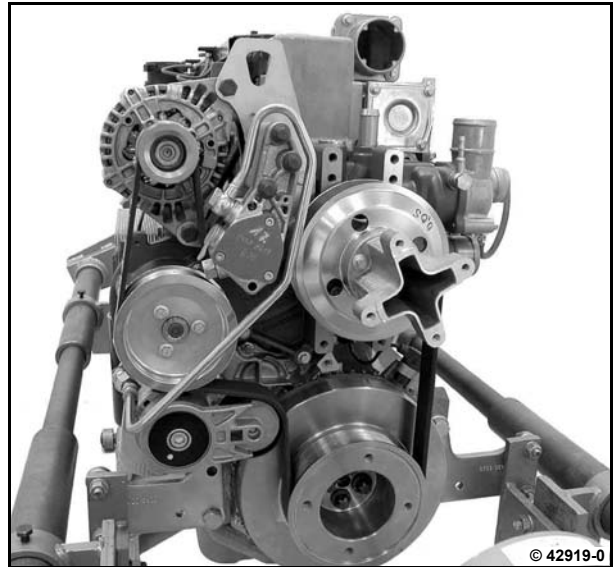
 [W 07-11-01](#)

- Mount belt tensioner (V-rib belt).

 [W 12-02-06](#)

- Mount fan drive.

 [W 09-13-02](#)



Removing and installing torsional vibration damper



Commercial available tools:

- Rotation angle disc 8190
- Socket wrench set, Torx-
E 20 8114

Special tools:

- Counter support 144 800



– W 12-02-06

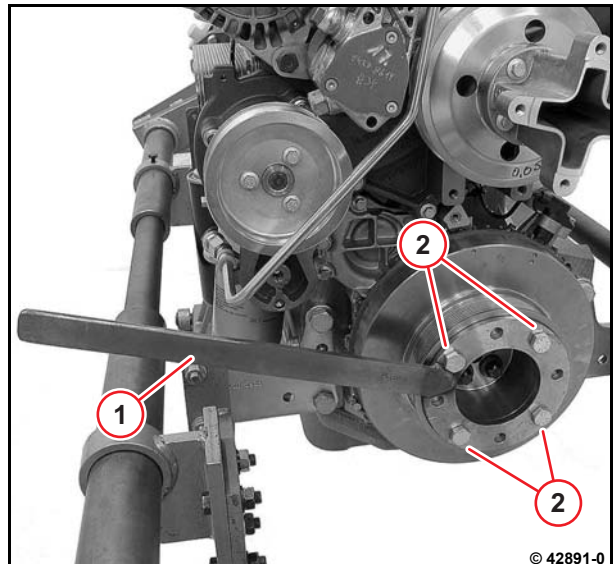
Removing the torsional vibration damper

- Remove belt tensioner (V-rib belt).



W 12-02-06

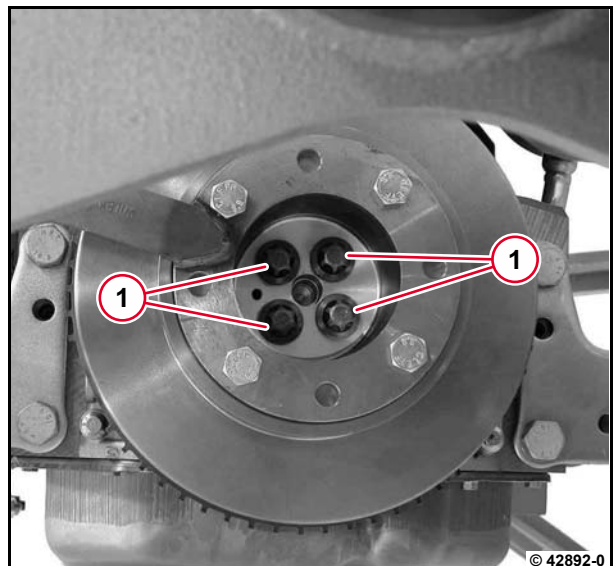
- Mount counter support (1) and tighten screws (2).



- Unscrew screws (1) and remove torsional vibration damper.



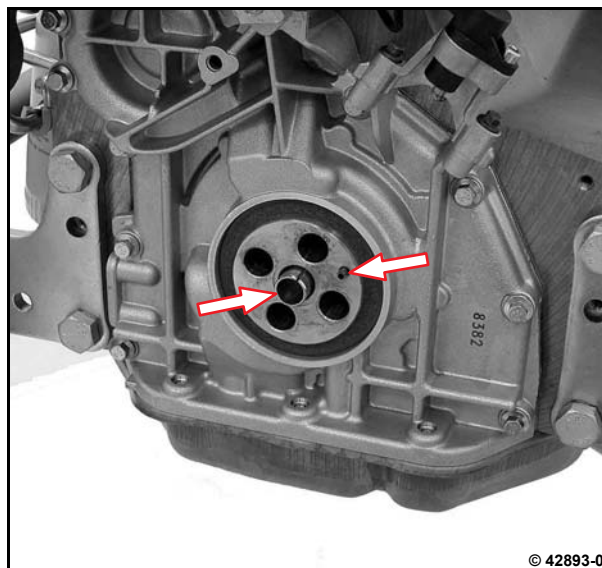
Use socket wrench set.



Installing the torsional vibration damper



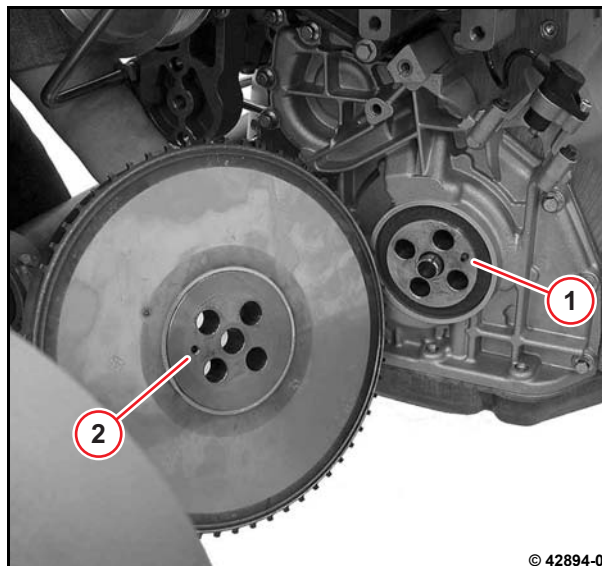
Make sure the clamping bushings (arrows) are in place.



- Mount the torsional vibration damper.



The clamping bushing (1) must grip in the hole (2).



- Tighten new screws.



A12 030



Attention!

Renew screws every time they are loosened.

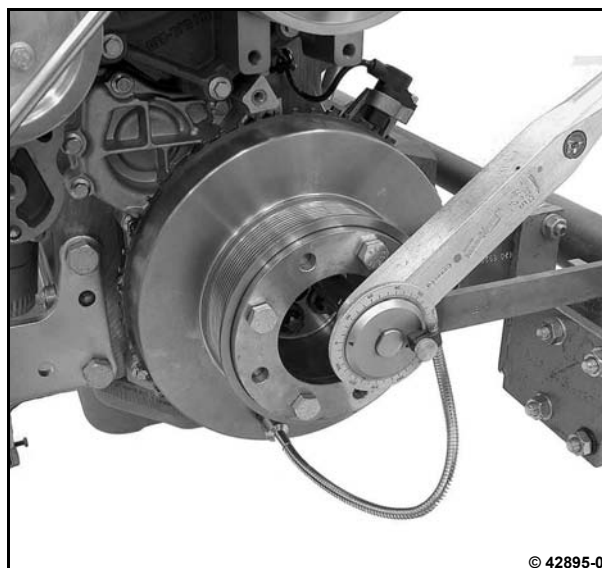


Use socket wrench set.

- Remove counter support.
- Mount belt tensioner (V-rib belt).



W 12-02-06



Removing and installing the belt tensioner (V-rib belt)

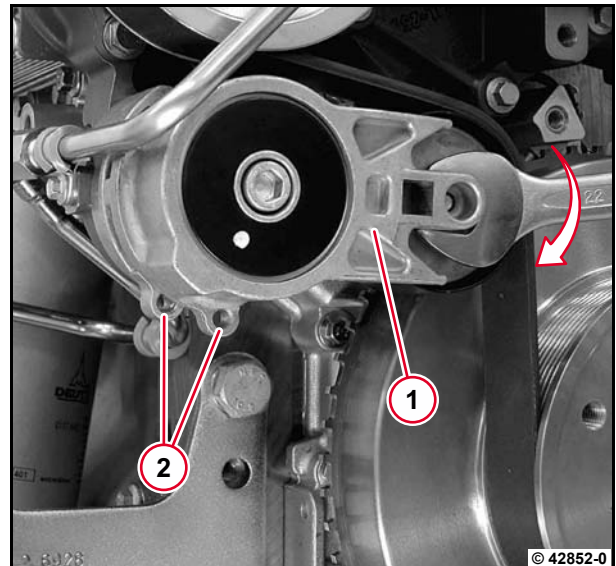


Commercial available tools:
– Mandrel 6 mm Ø

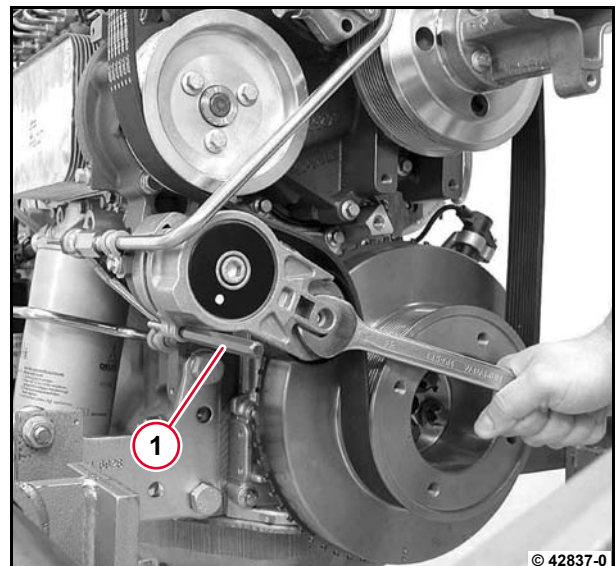
6

Removing the belt tensioner

- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



- Lock the belt tensioner with a suitable tool (1), e.g. mandrel 6 mm Ø.

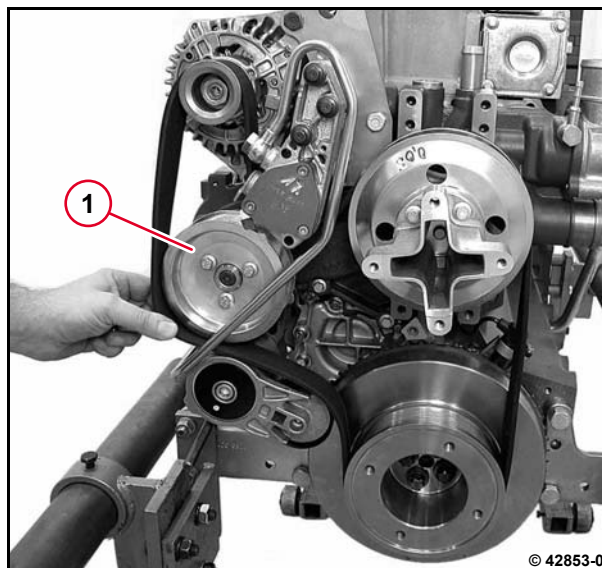


- Remove V-rib belt.

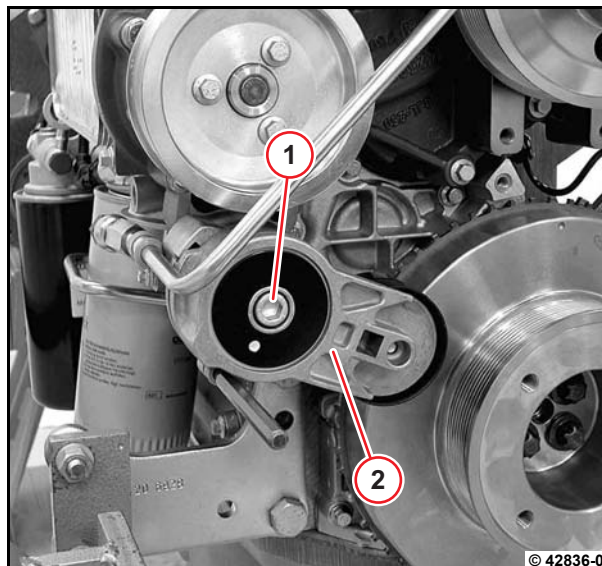


Mark the running direction when reusing the V-rib belt.

First remove the V-rib belt from the V-rib belt pulley (1).



- Unscrew screws (1) and remove belt tensioner (2).
- Visually inspect the components.

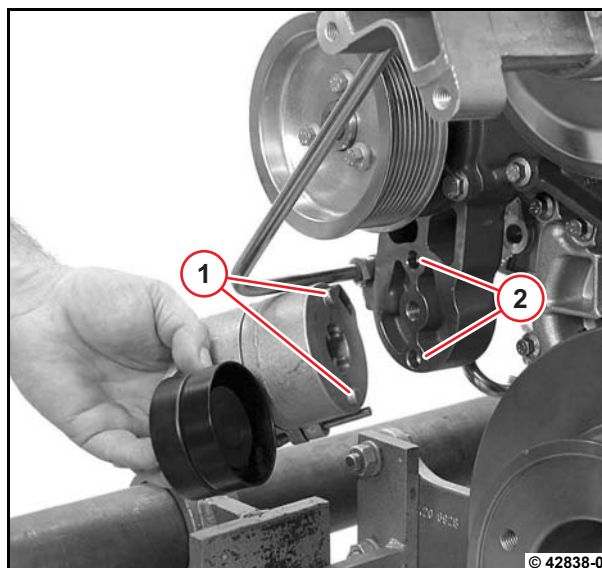


Installing the belt tensioner

- Mount the belt tensioner.

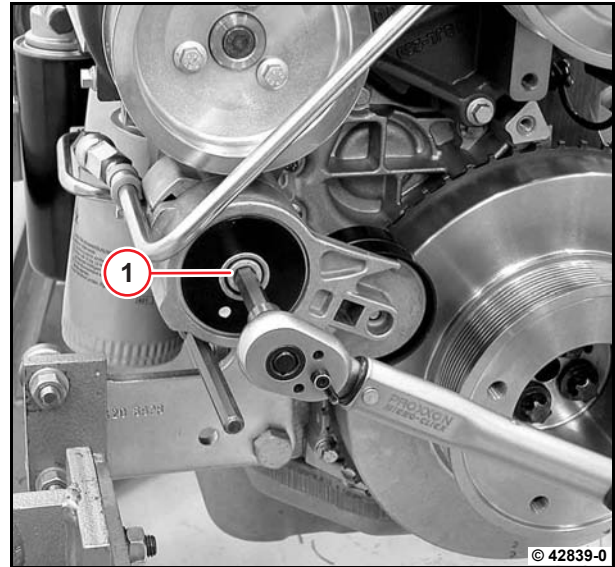


The fixing bolts (1) must grip in the holes (2).



- Tighten screw (1).

 A12 041



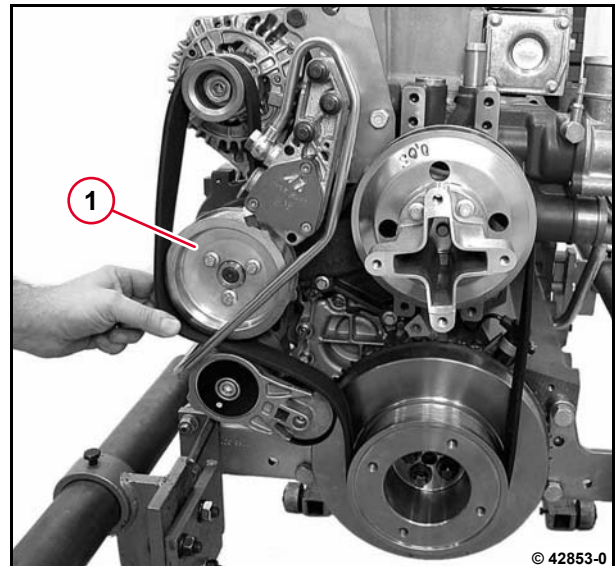
6

- Fit the V-rib belt according to the running direction.



Finally place the V-rib belt over the V-rib belt pulley (1).

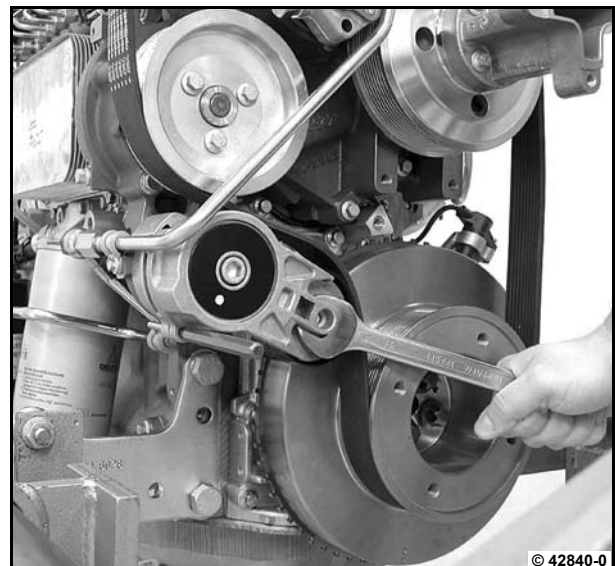
Ensure that the installation location of the V-rib belt is free from faults.



- Support the belt tensioner, remove the mandrel and slowly relieve the strain on the belt tensioner.



The V-rib belt is tightened automatically by the belt tensioner.



Checking the wear limit of the V-rib belt

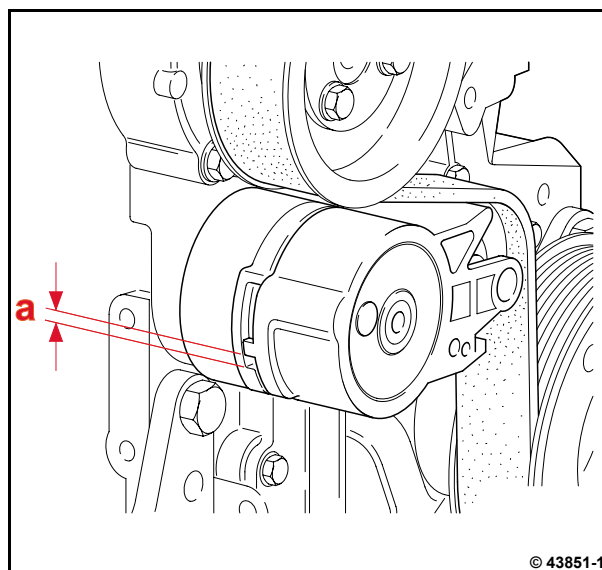


The fuel line has been removed to allow a better view.

- Measure distance (a).



If the distance (a) is less than 3 mm, the V-rib belt must be changed.



Removing and installing flywheel



Commercial available tools:

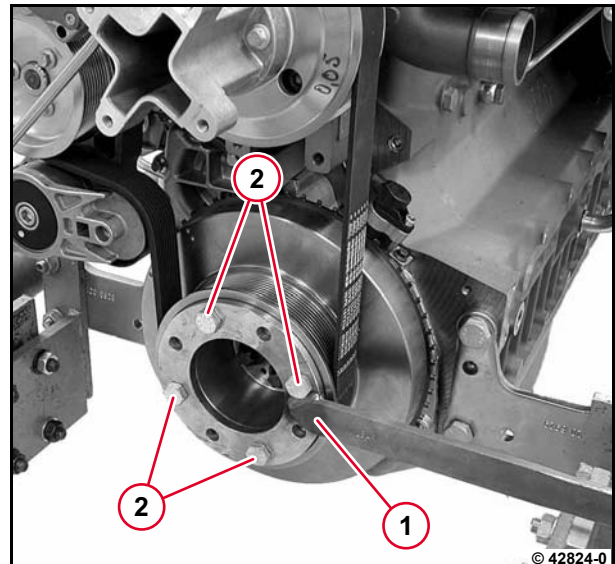
- Rotation angle disc 8190
- Guide pin (self-constructed)

Special tools:

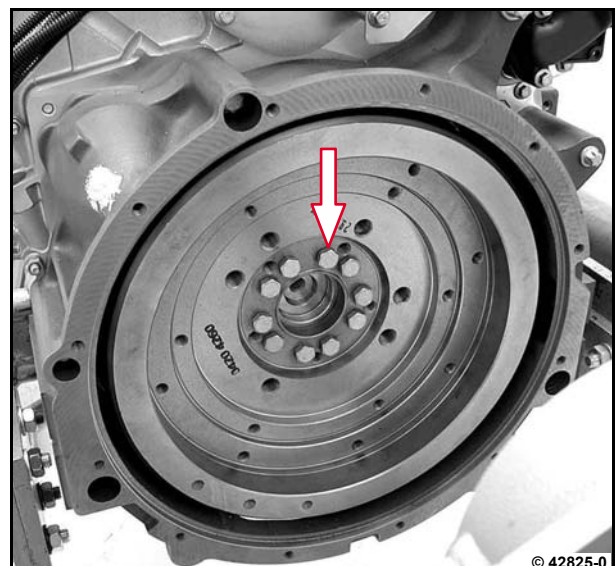
- Counter support 144 800

Removing the flywheel

- Mount counter support (1) and tighten screws (2).



- Unscrew all screws (arrow) and remove flywheel.
- Visually inspect the components.

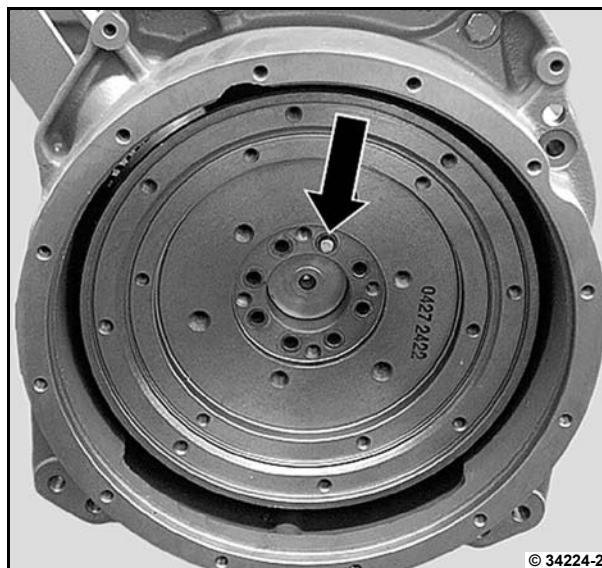


Installing flywheel

- Mount flywheel using a self-constructed guide pin (arrow).



The holes in the flywheel must match the threaded holes in the crankshaft flange.



- Tighten all new screws alternately.

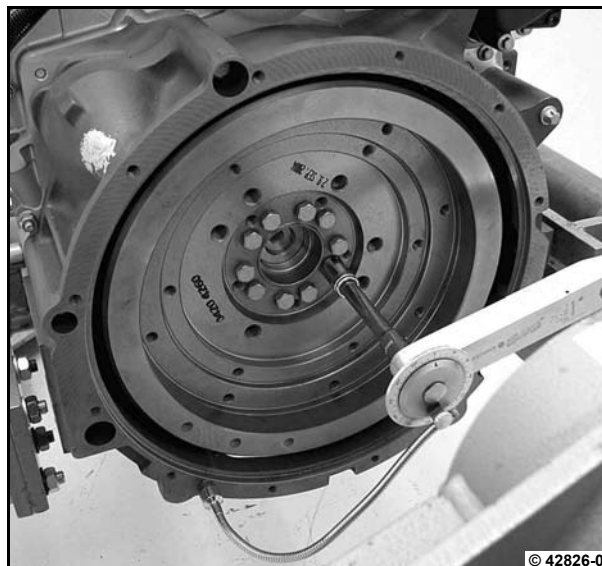


A12 001

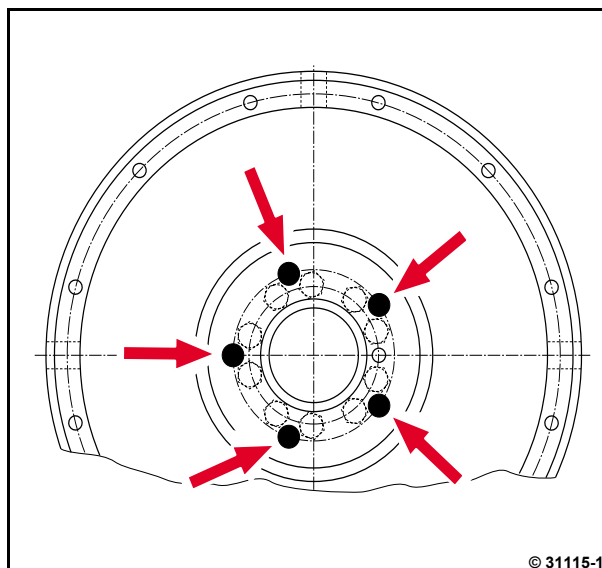


Attention!

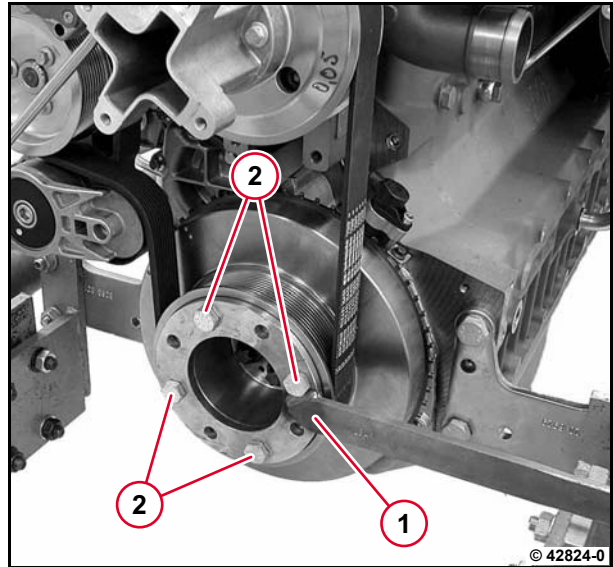
Renew screws every time they are loosened.



- Drive core plugs into the threaded holes (arrows) to the stop.



- Unscrew screws (2) and remove counter support (2).



Removing and installing the cable harness

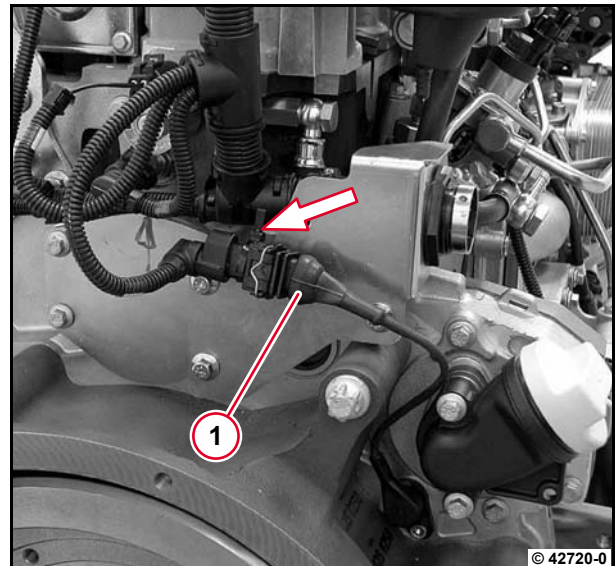


Commercial available tools

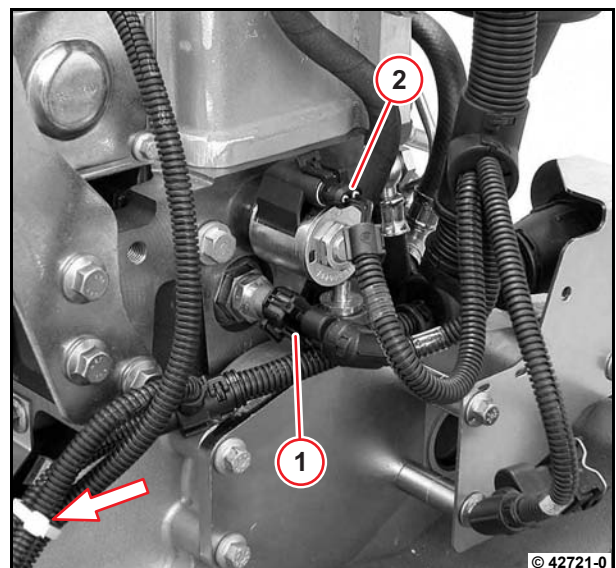
6

Removing the cable harness

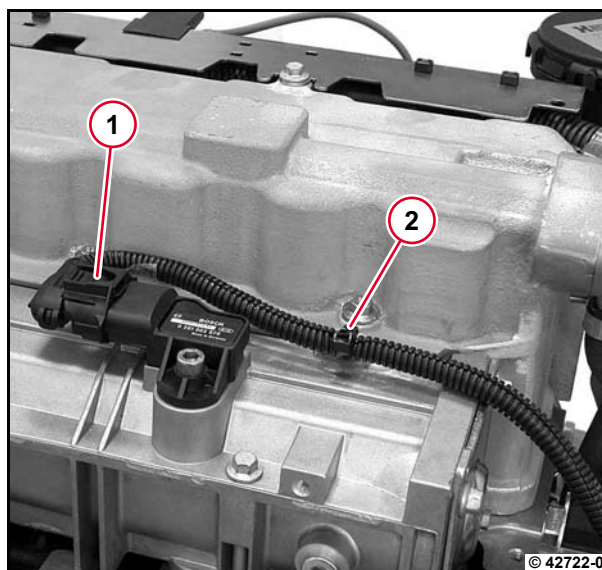
- Unlock and disconnect the cable plug (1) of the impulse transmitter (camshaft).
- Remove cable tie (arrow) and expose cable harness.



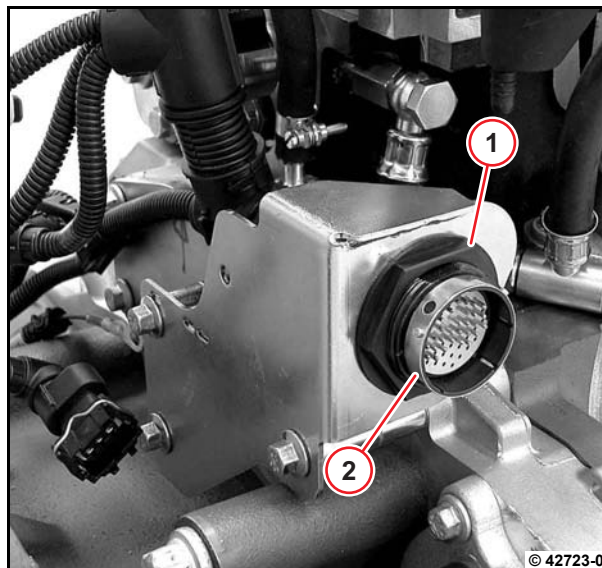
- Unlock cable plug (1) and remove coolant temperature sensor.
- Unlock cable plug (2) and remove from solenoid valve (exhaust gas return line).
- Remove cable tie (arrow) and expose cable harness.



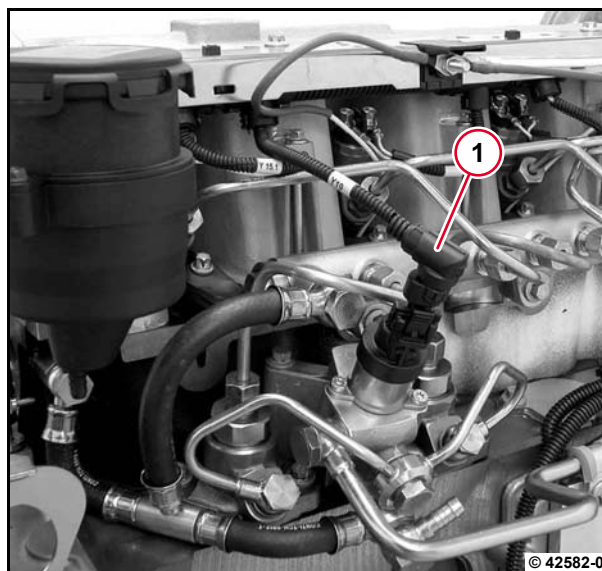
- Unlock cable plug (1) and pull off from pressure/temperature sensor.
- Remove cable tie (2) and expose cable harness.



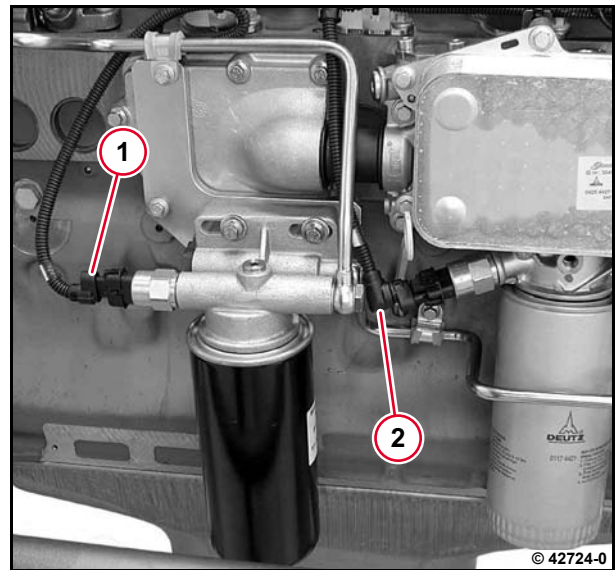
- Unscrew nut (1), pull central plug (2) out of holder.



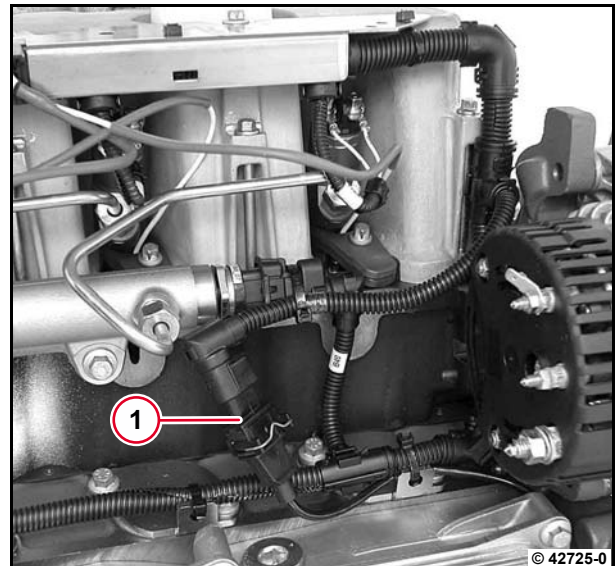
- Unlock cable plug (1) and remove.



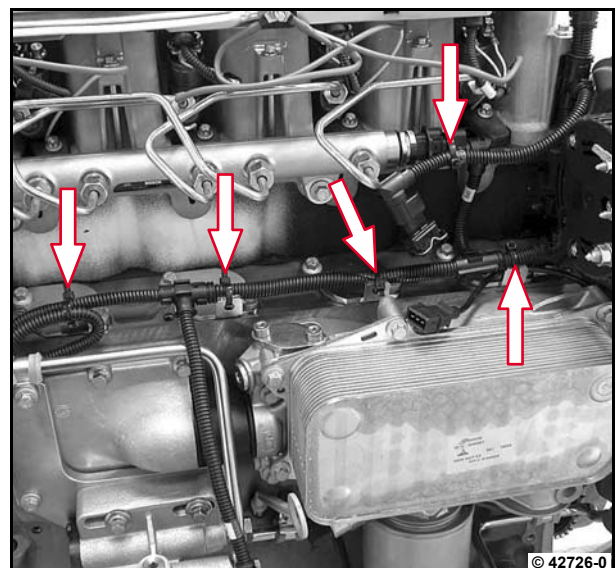
- Unlock cable plug (1) and remove from fuel pressure sensor.
- Unlock cable plug (2) and remove from oil pressure switch.



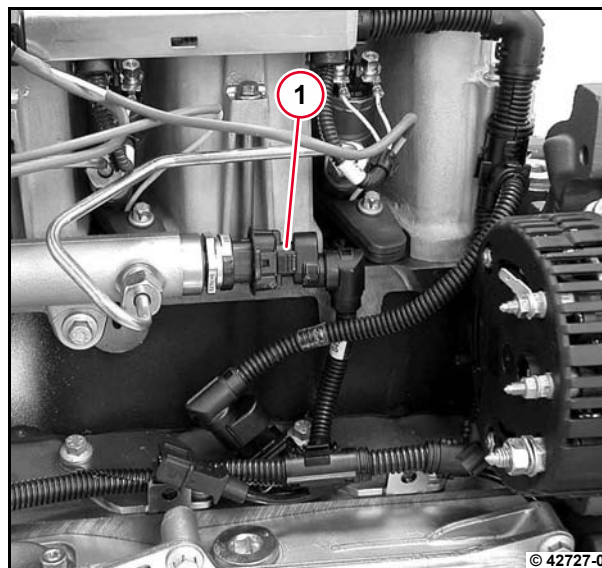
- Unlock and disconnect the cable plug (1) of the impulse transmitter (crankshaft).



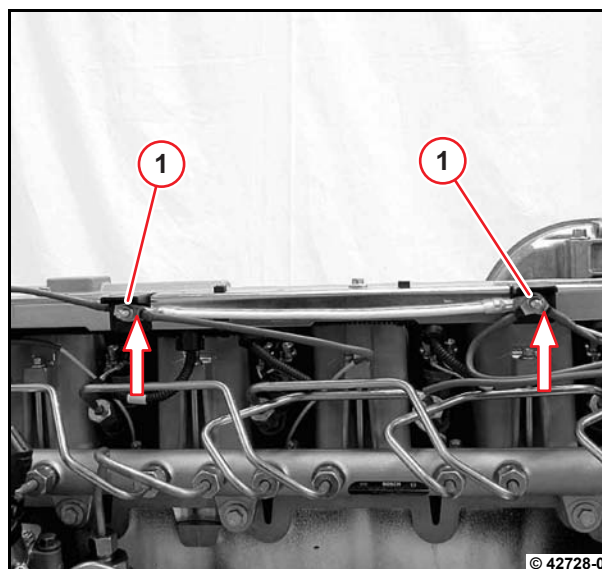
- Remove cable tie (arrows) and expose cable harness.



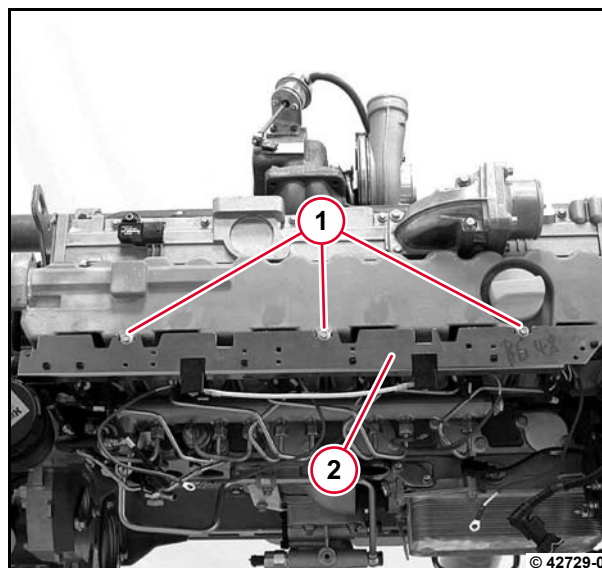
- Unlock cable plug (1) and remove from rail pressure sensor.



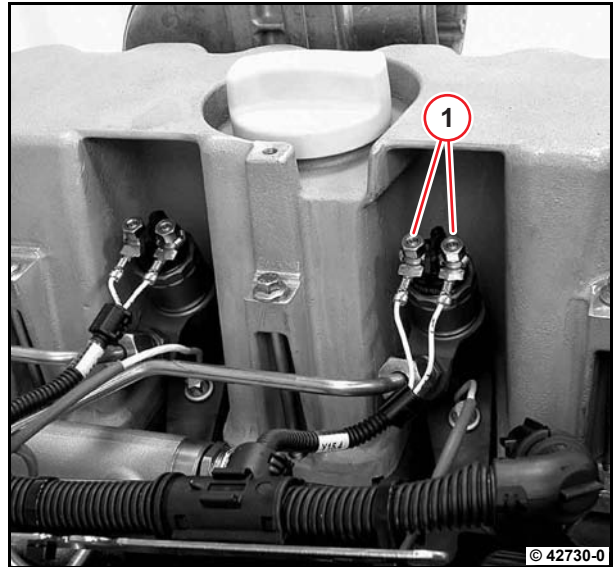
- Unscrew nuts (1) and remove cable ring eyes (arrows).



- Unscrew screws (1) and remove cover plate (2).

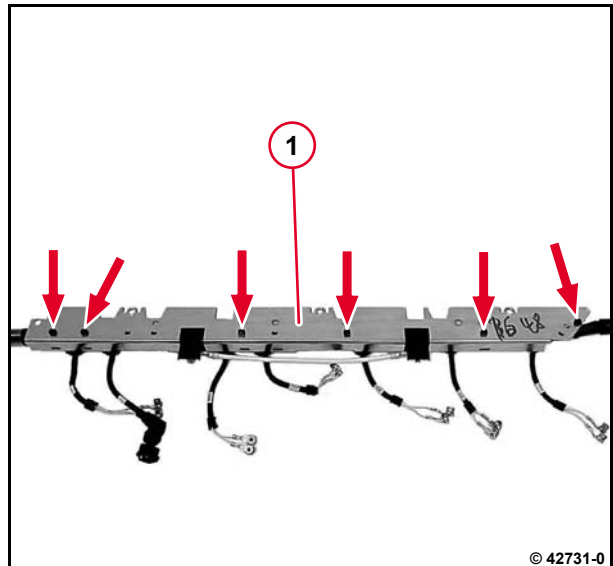


- Unscrew nuts (1) and remove cable plug from injector.
- Remove cable harness.



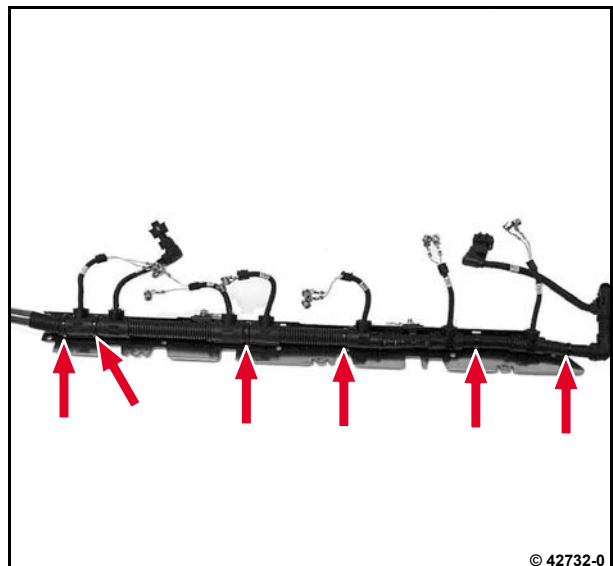
6

- Remove cable tie (arrows) and remove cover plate (1).
- Visually inspect the components.

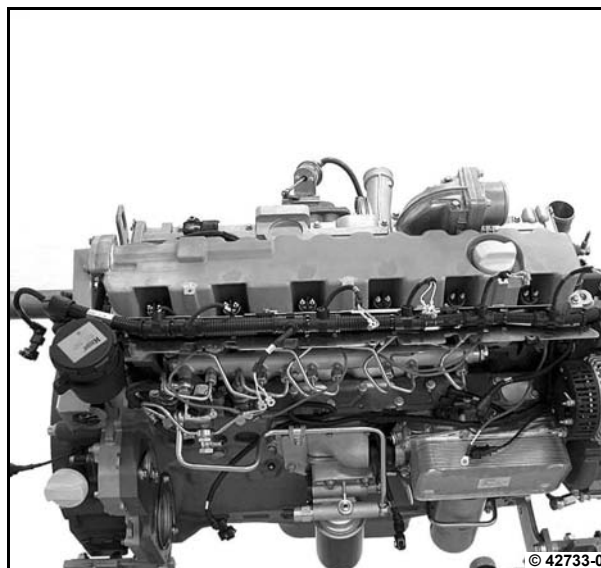


Installing the cable harness

- Position cable harness on the cover plate and fix with cable tie (arrows).

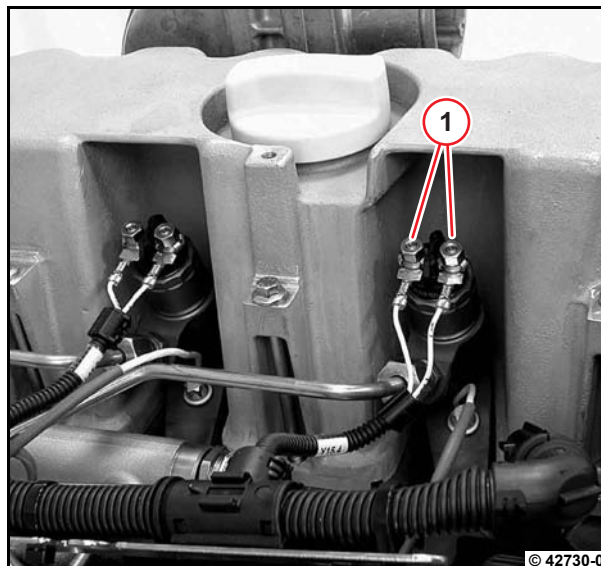


- Insert cable harness and attach cable plugs to the individual components.



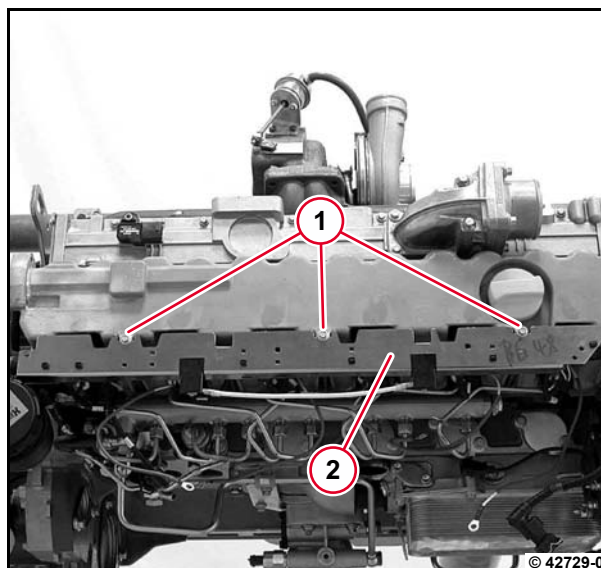
- Mount cable plug on injector and tighten nut (1).

 A13 051

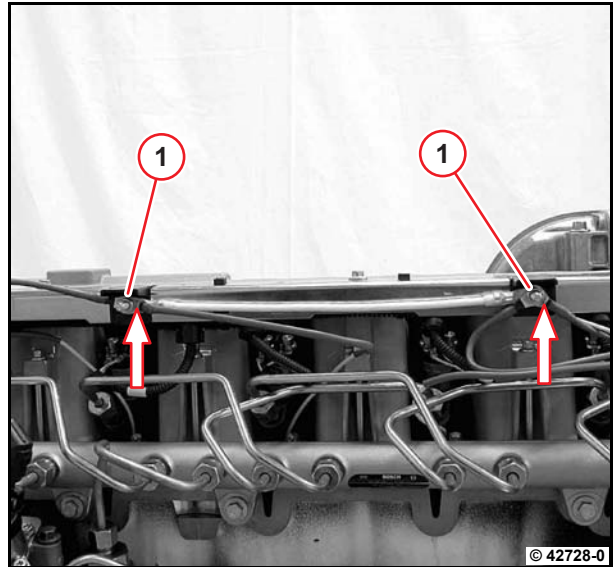


- Mount cover plate (2) and tighten screws (1).

 A13 041

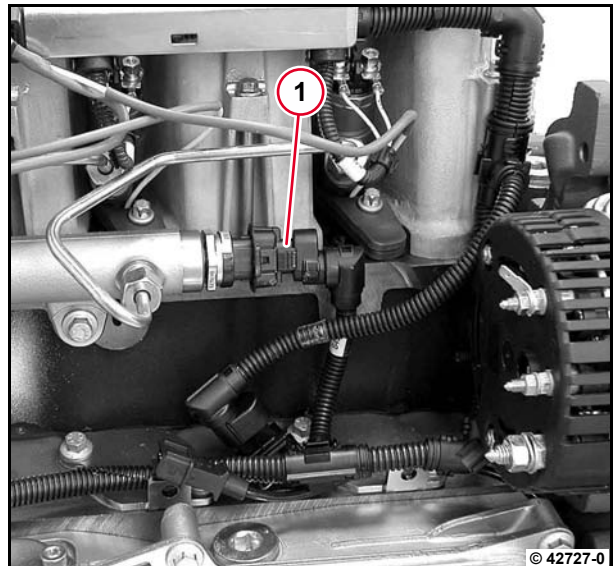


- Position cable ring eyes (arrows) and tighten nuts (1).



6

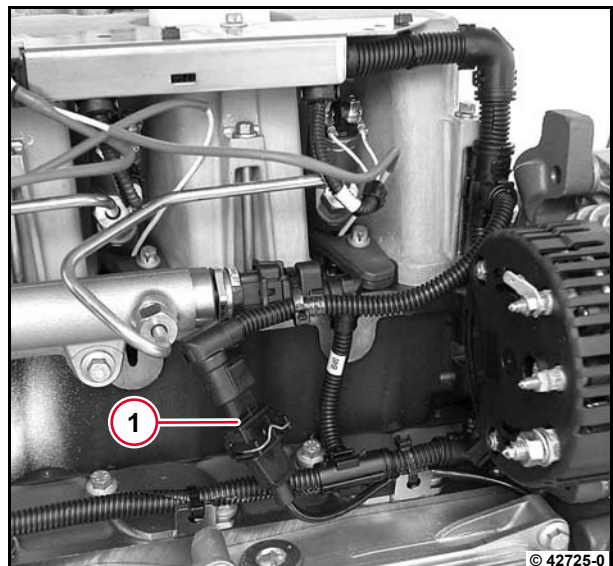
- Plug cable plug (1) into the rail pressure sensor.
- Ensure that the connection is perfect.



- Plug together the cable plugs (1) of the impulse transmitter (crankshaft).



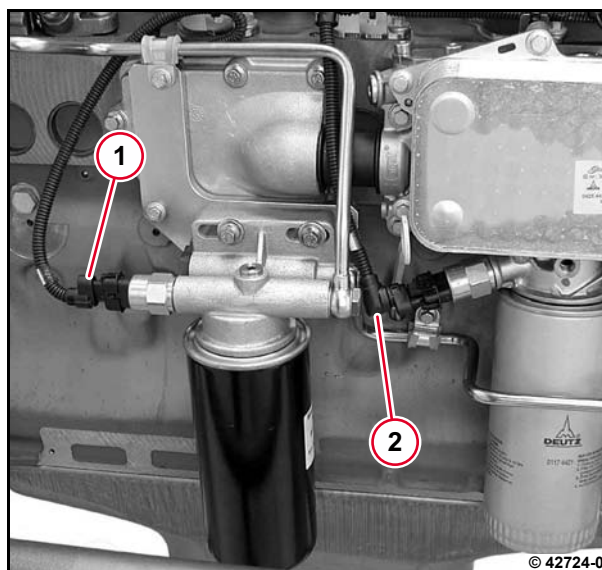
Ensure that the connection is perfect.



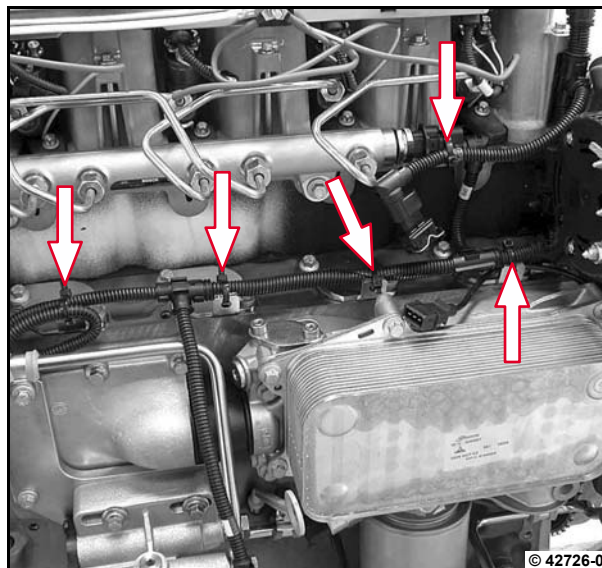
- Plug cable plug (1) into the fuel pressure sensor.
- Plug cable plug (2) into the oil pressure switch.



Ensure that the connection is perfect.



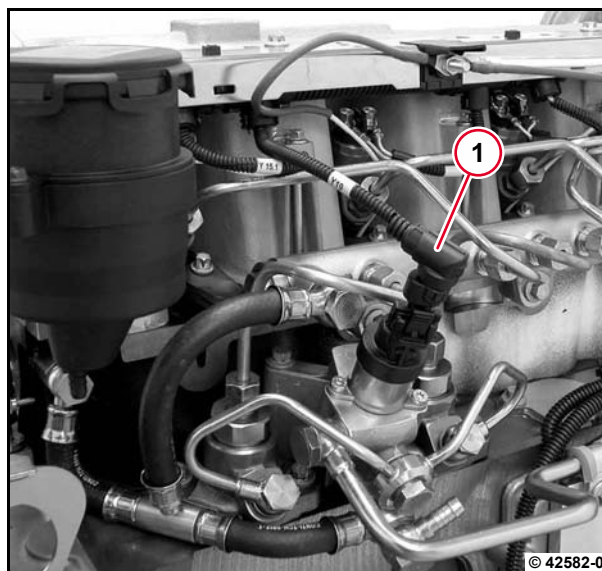
- Lay cable harness and fix with cable tie (arrows).



- Plug in the cable plug (1).



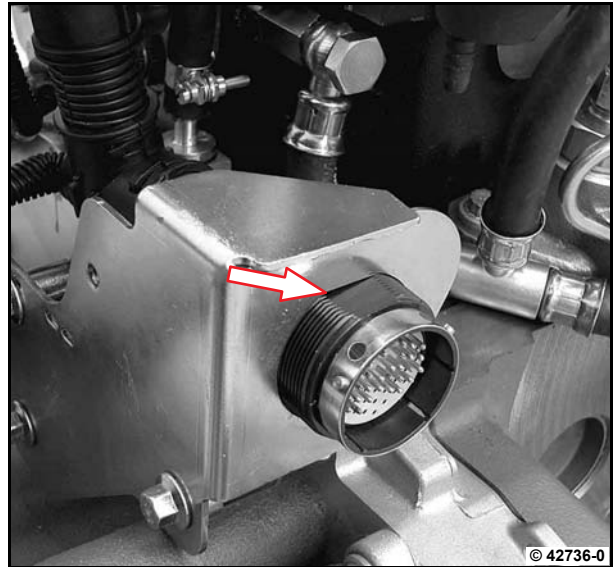
Ensure that the connection is perfect.



- Plug central plug into the holder and tighten the nut.



The flattened side of the central plug and the holder must be in line (arrow).



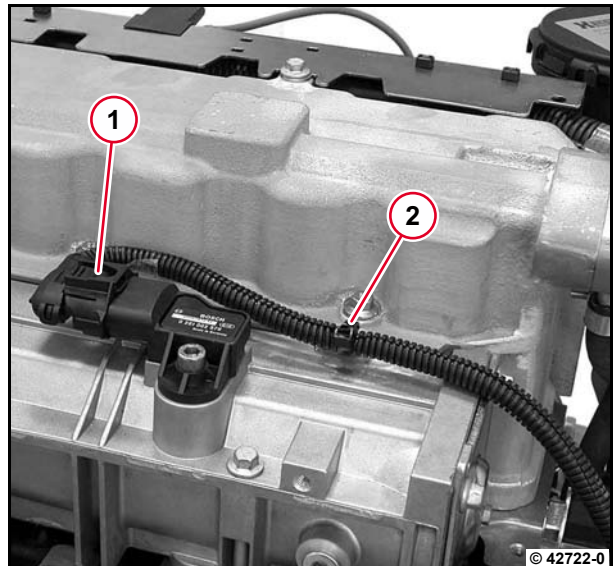
6

- Plug cable plug (1) into pressure/temperature sensor.



Ensure that the connection is perfect.

- Lay cable harness and fix with cable tie (2).

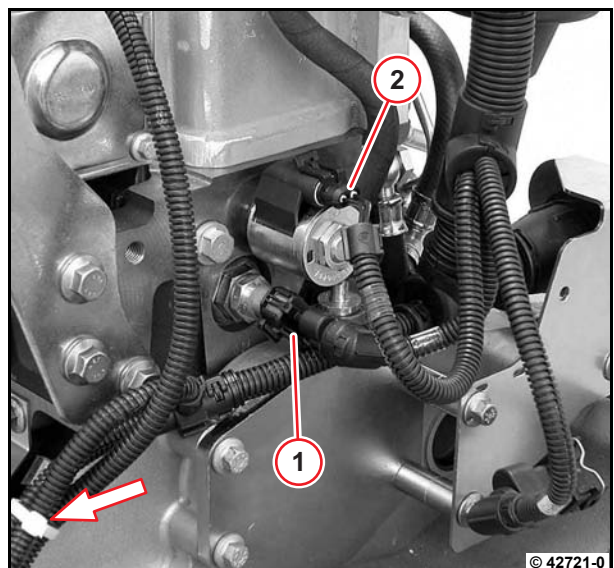


- Plug cable plug (1) into coolant temperature sensor.
- Plug cable plug (2) into the solenoid valve (exhaust gas return line).



Ensure that the connection is perfect.

- Lay cable harness and fix with cable tie (arrow).

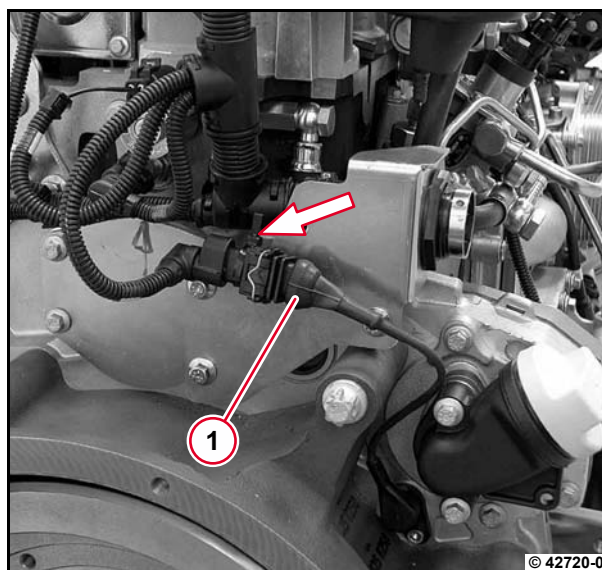


- Plug together the cable plugs (1) of the impulse transmitter (camshaft).



Ensure that the connection is perfect.

- Lay cable harness and fix with cable tie (arrow).



Removing and installing the generator (V-rib belt drive)

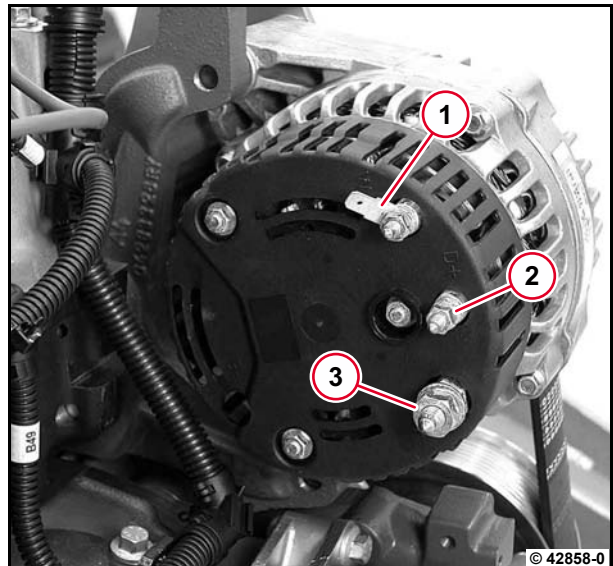


Commercial available tools:
– Mandrel 6 mm Ø

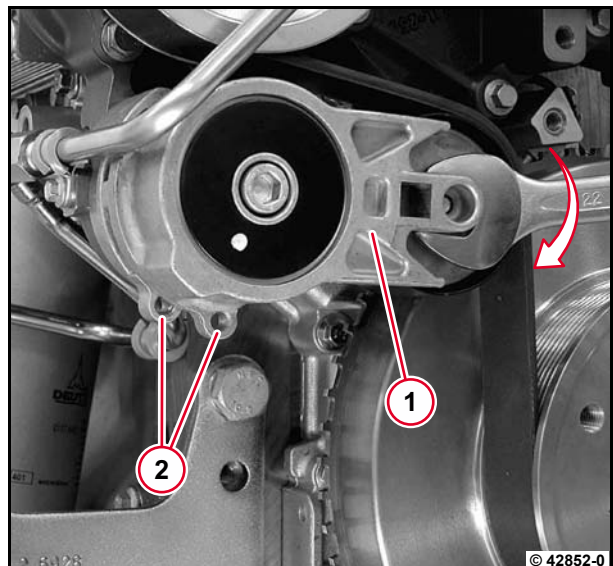
6

Remove generator

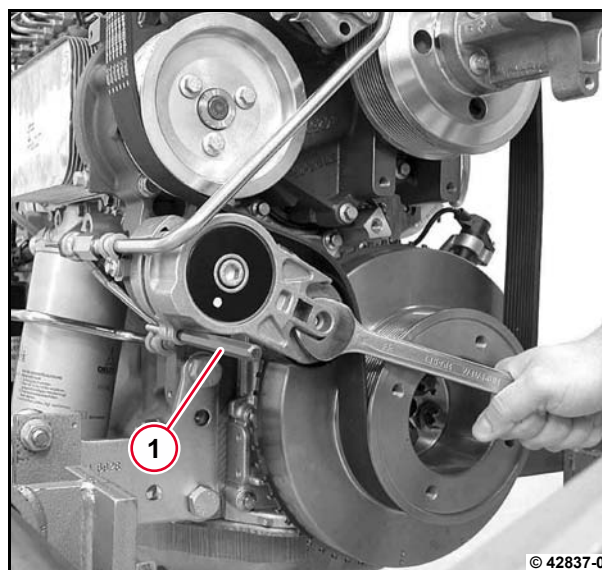
- Disconnect the battery's negative terminal.
- Disconnect the cable from the generator if present.
 - Cable-W (1)
 - Cable-D+ (2)
 - Cable-B+ (3)



- Tighten belt tensioner (1) in direction of arrow until the holes (2) are in line.



- Lock the belt tensioner with a suitable tool (1), e.g. mandrel 6 mm Ø.

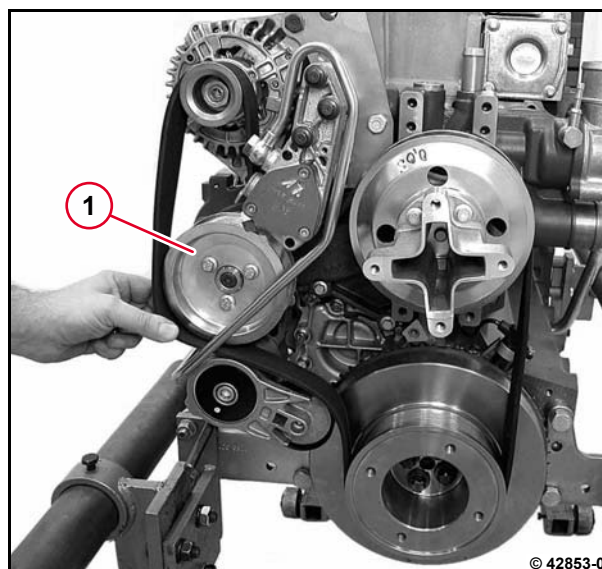


- Remove V-rib belt.

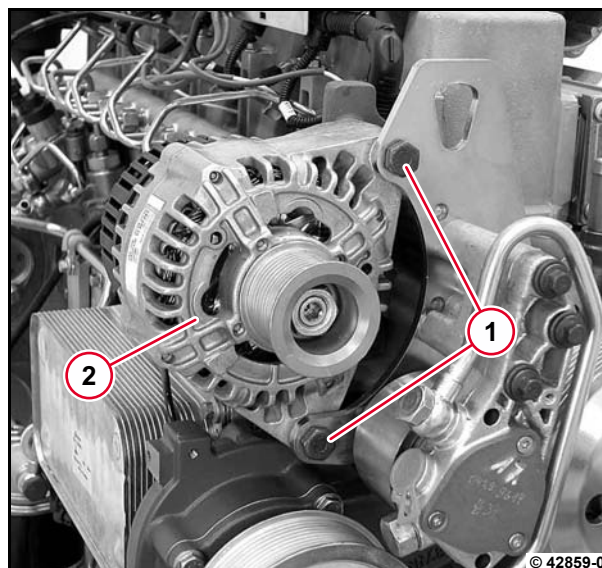


Mark the running direction when reusing the V-rib belt.

First, remove the V-rib belt from the V-rib belt pulley (1).



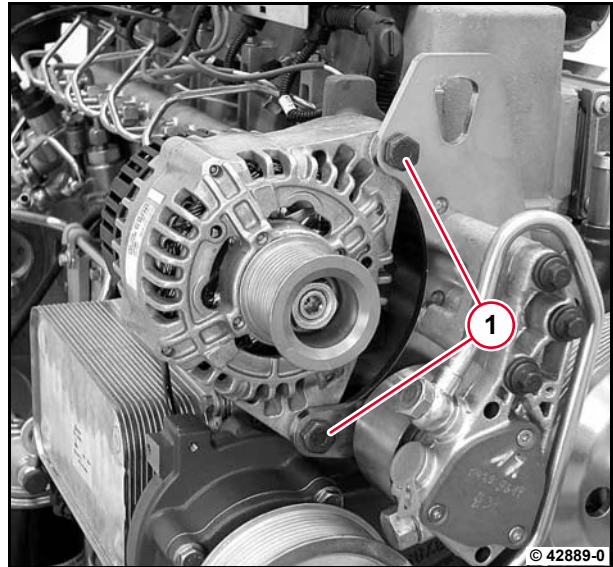
- Unscrew screws (1) and remove generator (2).
- Visually inspect the components.



Installing generator

- Mount generator and tighten screws (1).

 A13 012



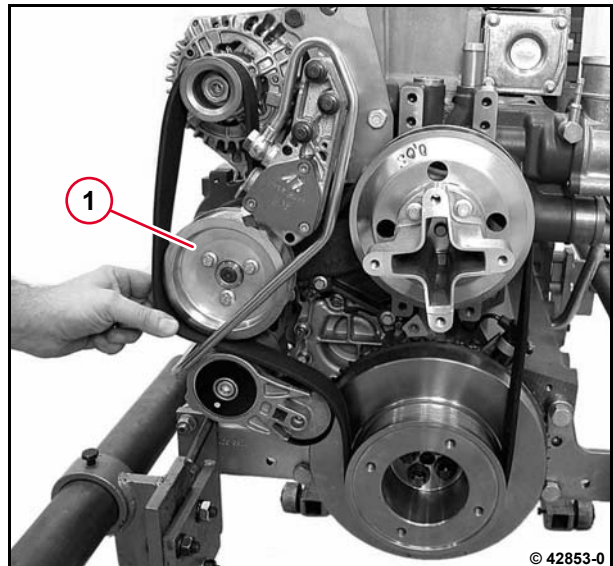
6

- Fit the V-rib belt according to the running direction.



Finally place the V-rib belt over the V-rib belt pulley (1).

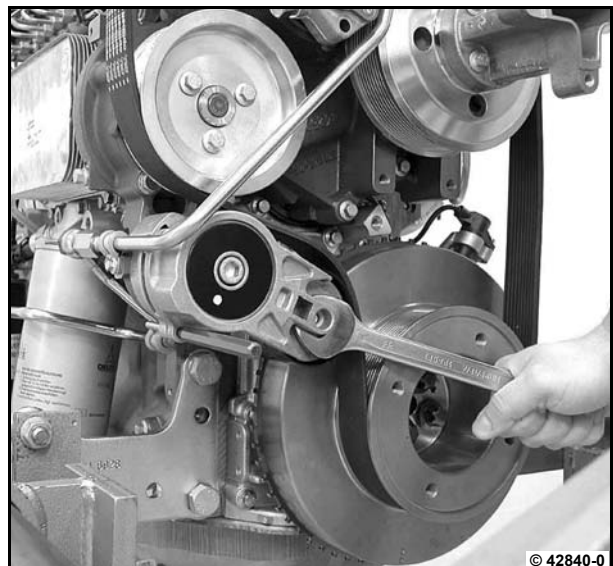
Ensure that the installation location of the V-rib belt is free from faults.



- Hold the belt tensioner, remove the mandrel and slowly relieve the strain on the belt tensioner.



The V-rib belt is tightened automatically by the belt tensioner.



Checking the wear limit of the V-rib belt

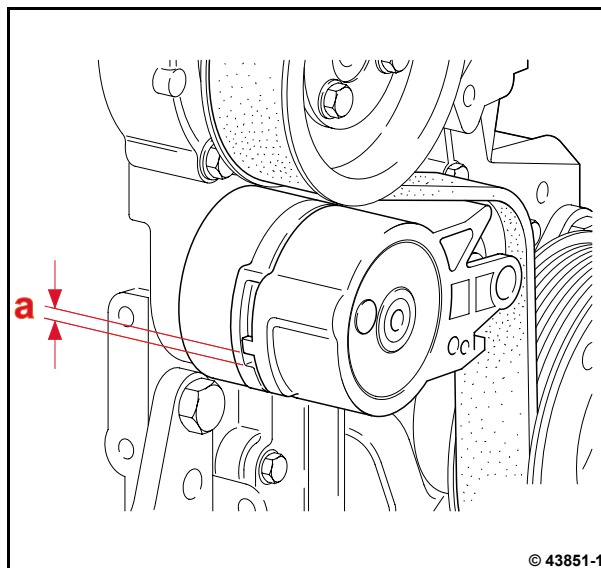


The fuel line has been removed for a better view.

- Measured distance (a).



If the distance (a) is less than 3 mm, the V-rib belt must be changed.



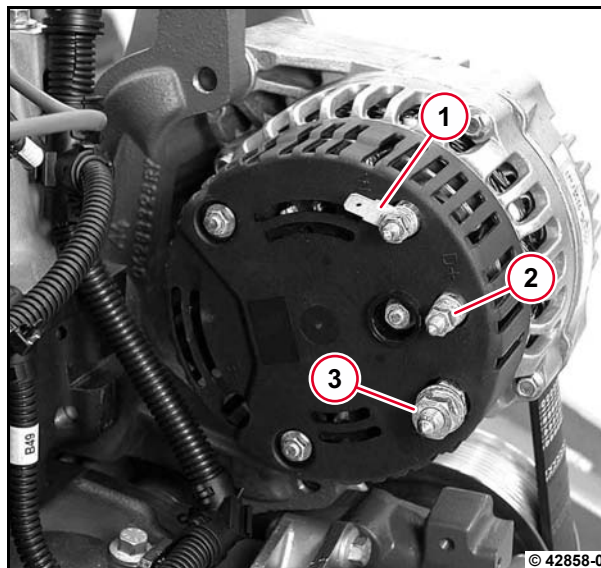
- Plug cable into generator if present.



Note the assignment of the cables:

- Cable-W (1)
- Cable-D+ (2)
- Cable-B+ (3).

- Connect the battery's negative terminal.



Removing and installing the starter

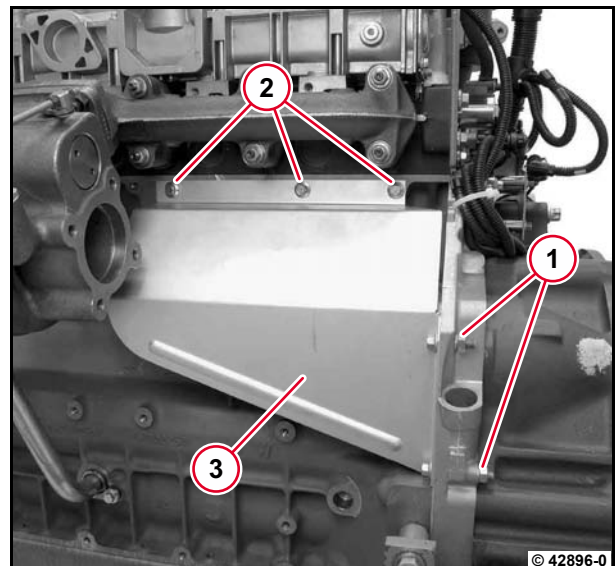


Commercial available tools

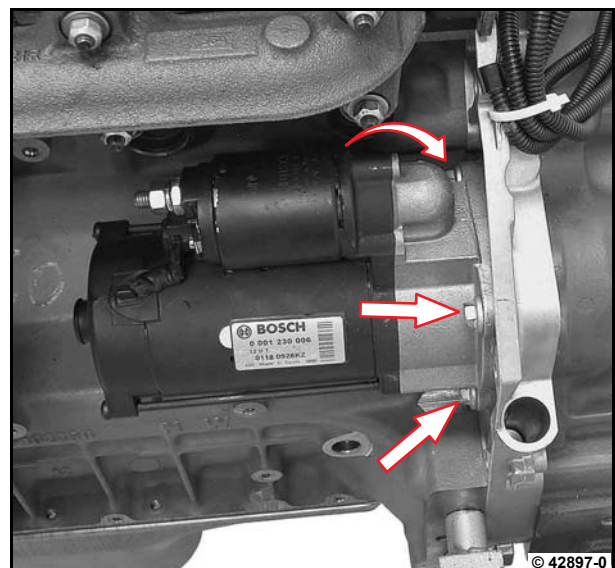
6

Removing starter

- Disconnect the battery's negative terminal.
- Unscrew nuts (1) and remove.
- Unscrew screws (2) and remove heat shield (2).



- Remove cable from starter if available.
- Unscrew screws (arrows) and remove starter.
- Visually inspect the components.

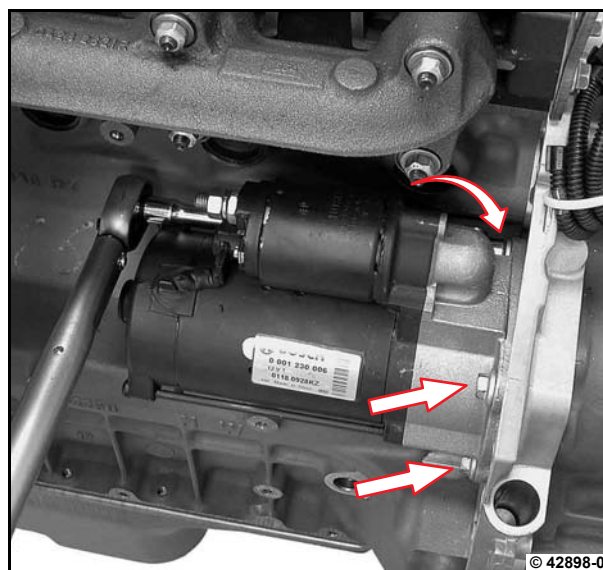


Installing starter

- Insert starter and tighten screws (arrows).

 **A13 001**

- Plug cable into starter if available.



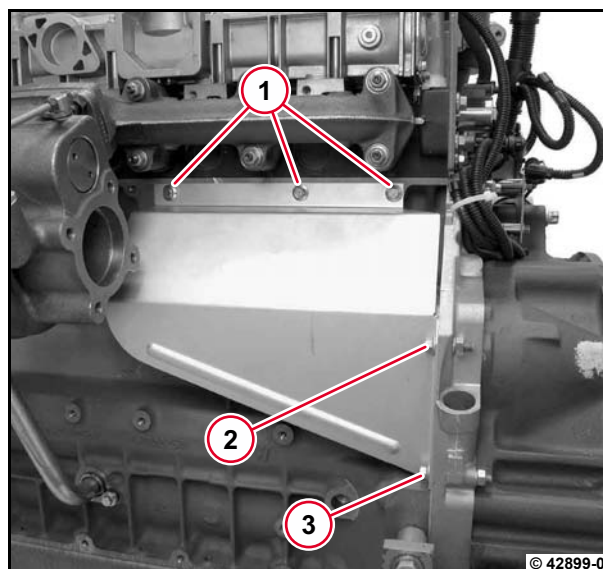
- Mount the heat shield and fasten screws (1).
- Insert screws and tighten nuts.



Note the different screw lengths:

Screw M8 x 30 mm (2)

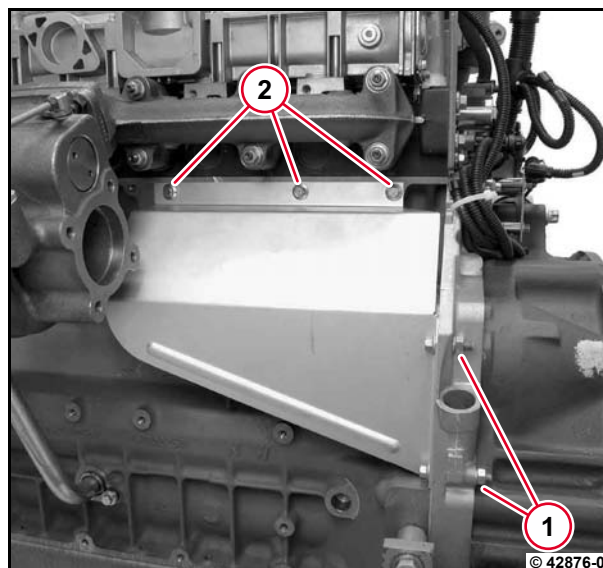
Screw M8 x 50 mm (3)



- Tighten screws (2).
- Tighten nuts (1).

 **A13 007**

- Connect the battery's negative terminal.



Removing and installing the heating plugs



Commercial available tools

Special tools:

– Claw wrench 120 430



– W 07-15-11

– User notes



Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.



Attention!

Ensure utmost cleanliness when working on the fuel system.

Remove residue paint and particles of dirt before removing.

Carefully clean the area around the affected parts. Blow damp areas dry with compressed air.

Observe the safety regulations and national specifications for handling fuels.

Close all connections immediately after opening with new, clean stoppers/caps.

Do not remove stoppers/caps until immediately before assembling.

Collect leaking operating fluids in suitable vessels and dispose of according to regulations.

Removing the heating plugs

- Unscrew nuts (1) and remove cable ring eyes (arrows).
- Remove injectors.

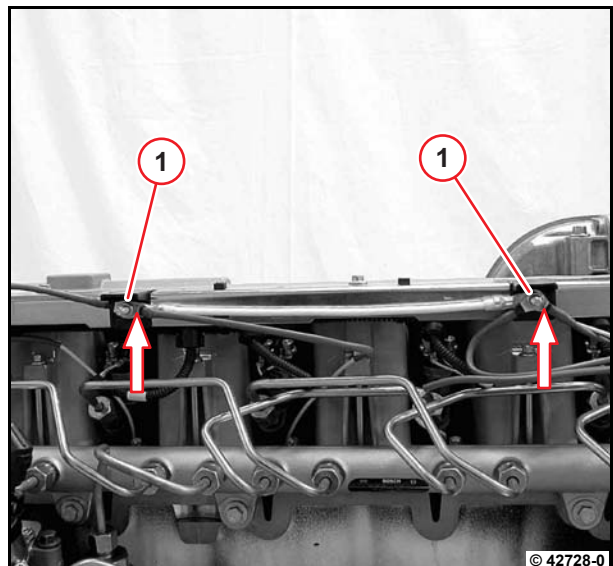


W 07-15-11



Attention!

Remove residue paint and particles of dirt from the injector before removing it. Carefully clean the area around the injector.



- Loosen and unscrew heating plugs with claw wrench.
- Visually inspect the component.



Installing the heating plugs

- Screw in heating plugs and tighten with claw wrench.

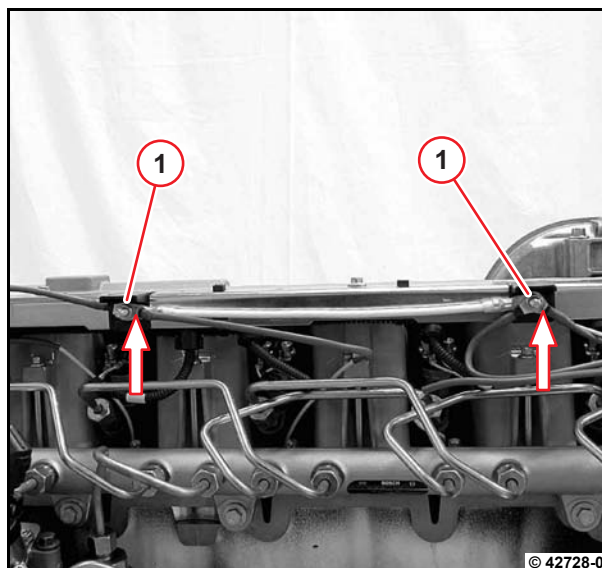
 [A13 032](#)

- Install injectors.

 [W 07-15-11](#)



- Mount cable ring eyes (arrows) and tighten nuts (1).



Removing and installing pressure/temperature sensor (charge air)



Commercial available tools

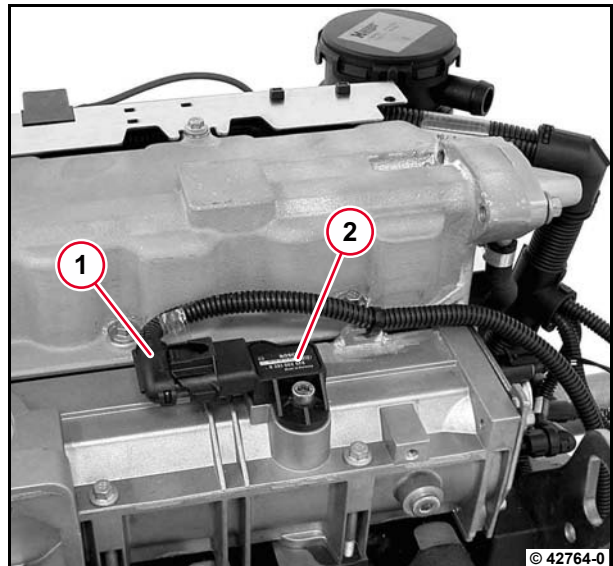


– Assembly aid
DEUTZ AP 1908

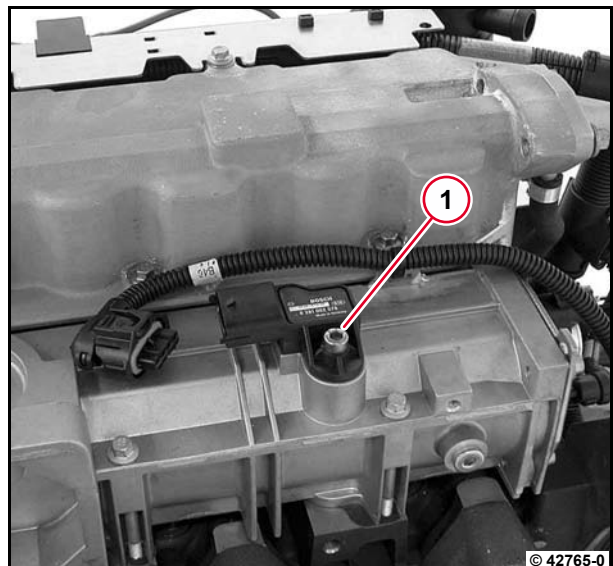
6

Removing pressure/temperature sensor

- Release cable plug (1) and pull off from the pressure/temperature sensor (2).

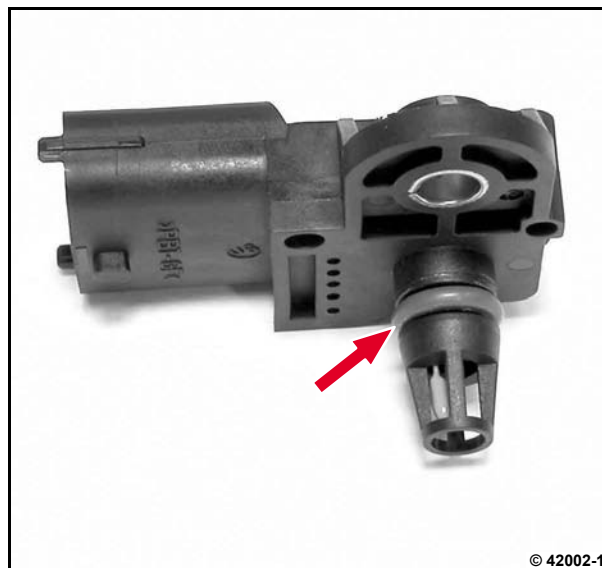


- Unscrew screw (1) and remove pressure/temperature sensor.



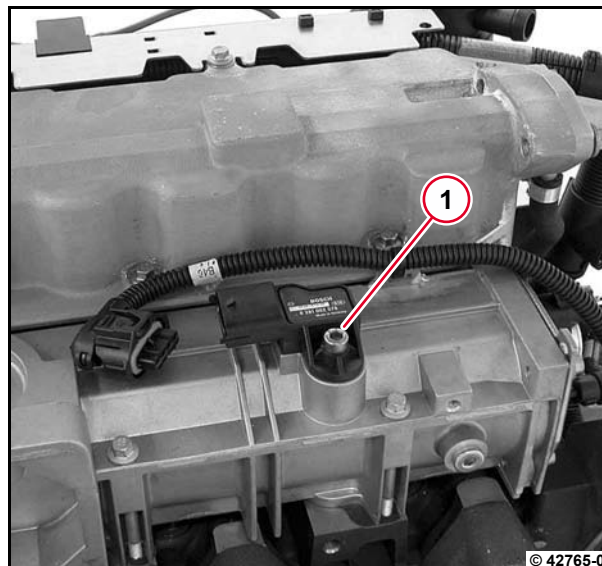
Installing pressure/temperature sensor

- Pull new O-ring (arrow) onto pressure/temperature sensor.
- Lightly coat O-ring with fitting compound.



- Insert pressure/temperature sensor and tighten the screw (1).

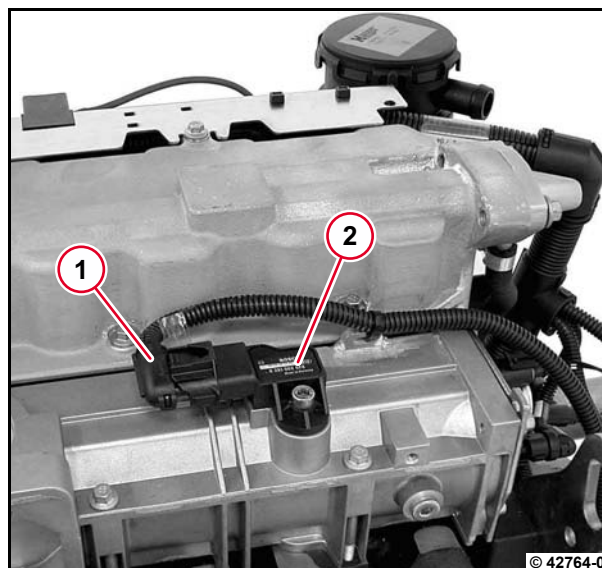
 A13 046



- Plug the cable plug (1) into the pressure/temperature sensor (2).



Ensure that the connection is perfect.



7 Standard tools



Orders

The tools can be ordered directly, stating the order number, from:

WILBAER

Wilhelm Bäcker GmbH & Co.KG

Postfach 14 05 80

42826 Remscheid

Germany

Phone: +49 (0) 2191 9339-200

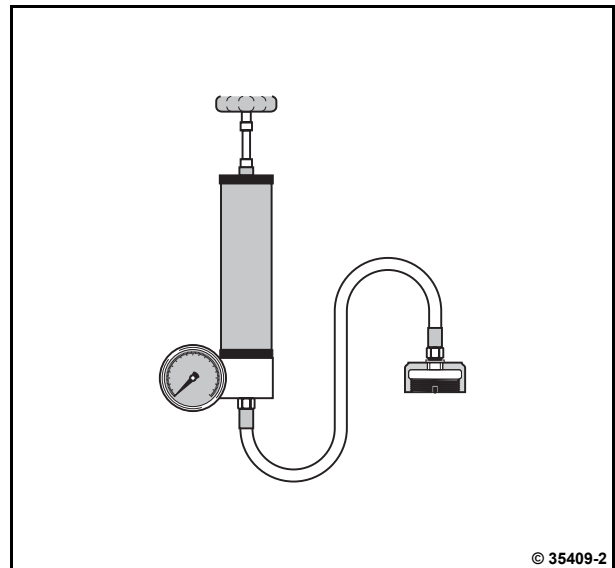
Fax: +49 (0) 2191 9339-0

E-mail: info@wilbaer.de

Web: <http://www.deutz-tools.com>

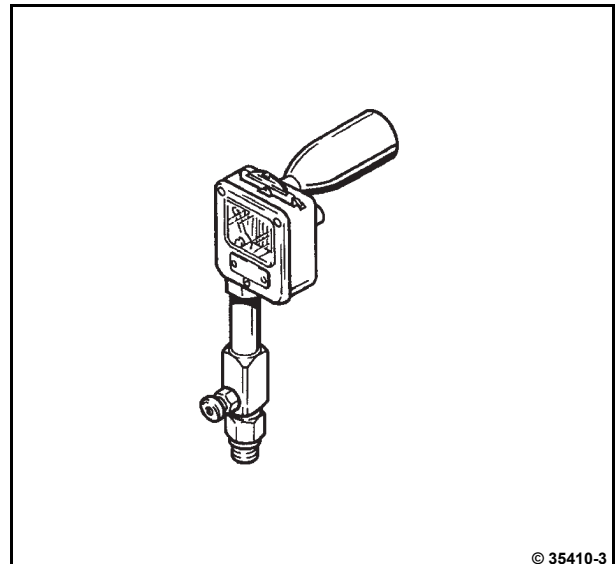
8002**Pressure pump**

Checking fuel system for leak-tightness

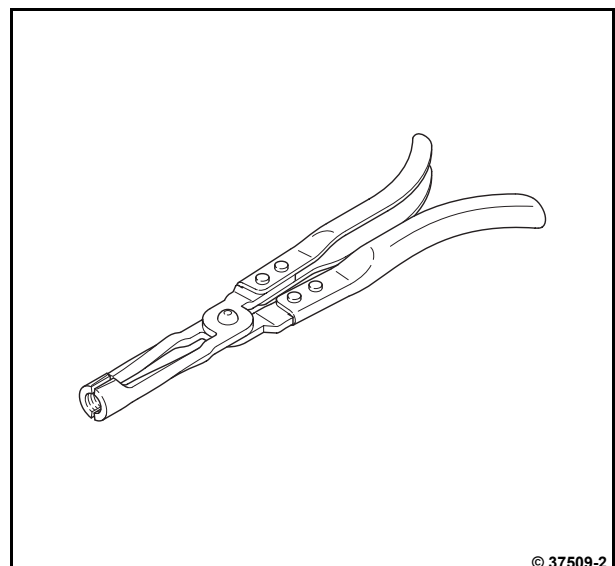
**8005****Compression pressure tester**

for diesel engines

10 - 40 bar

**8024****Assembly pliers**

Removing valve stem gaskets



8113

Socket wrench insert

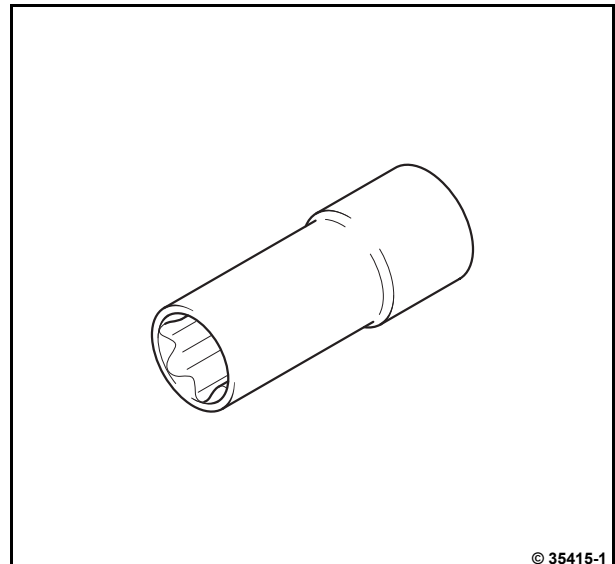
Torx - E 14



8114

Socket wrench insert

Torx - E 20

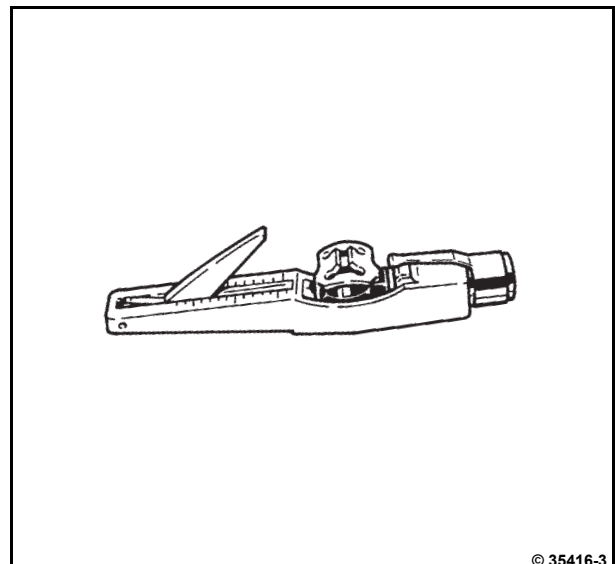


8115

V-belt tension meter

150 to 600 N

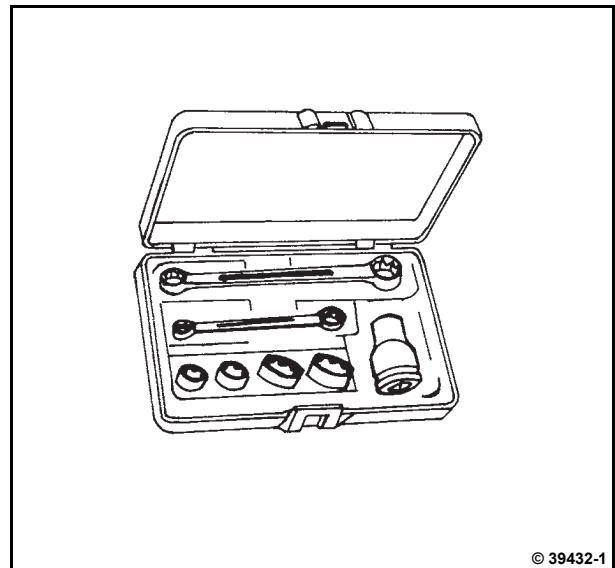
for checking the V-belt tension



8189**Torx tool set**

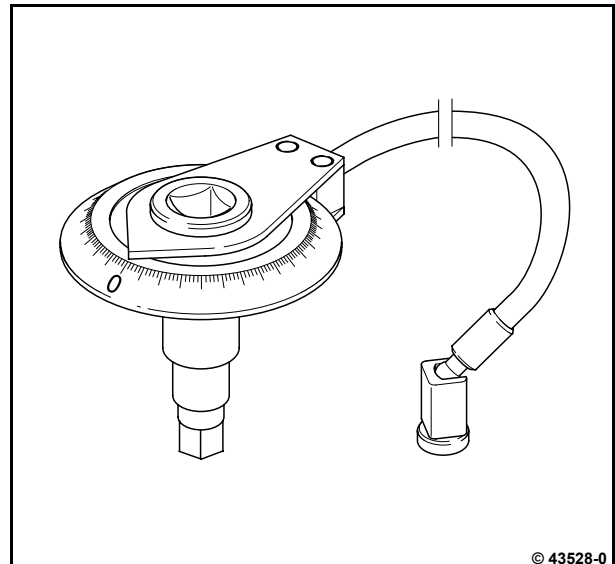
Case containing:

- Double-ended ring spanner E6/E8
- Double-ended ring spanner E10/E12
- Socket wrench insert E8 and E10 (1/4 inch)
- Socket wrench insert E10 and E12 (3/8 inch)
- Socket wrench insert E18 (1/2 inch)

**8190****Rotation angle disc**

with magnet

Setting valve clearance

**8191****Screwdriver insert**

for slotted screw

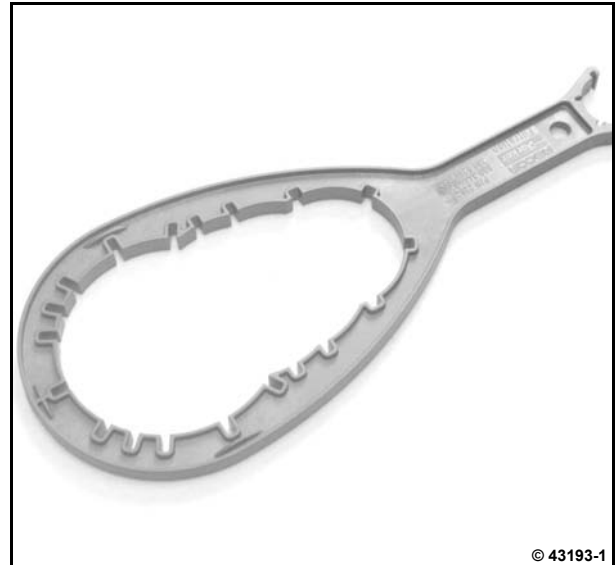
Valve clearance setting



8192

Bowl wrench

Fuel pre-filter (type: Racor)

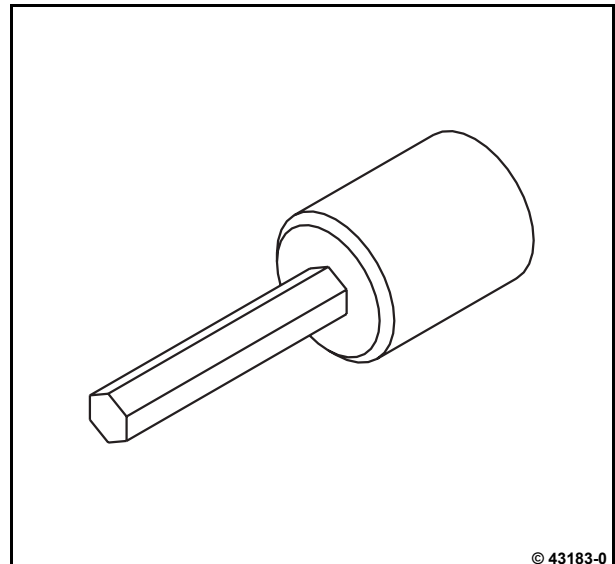


© 43193-1

8194

Screwdriver insert

with hexagonal socket (size 4 mm),
1/2 inch, long version
(in conjunction with rotation angle disc 8190)



© 43183-0

8196

Open end wrench adapter

Size 13,
for torque wrench
Tightening of lock nut of the valve clearance setting
screw



© 43019-0

8198**Pricker**

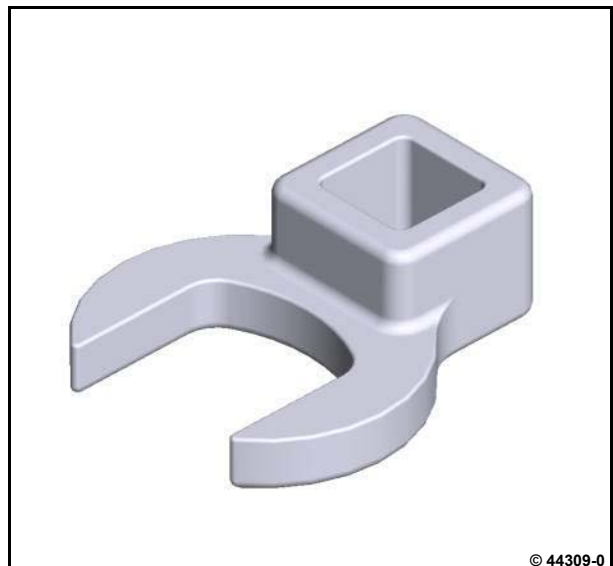
Removing rotary shaft lip seal

**8199****Crowfoot wrench**

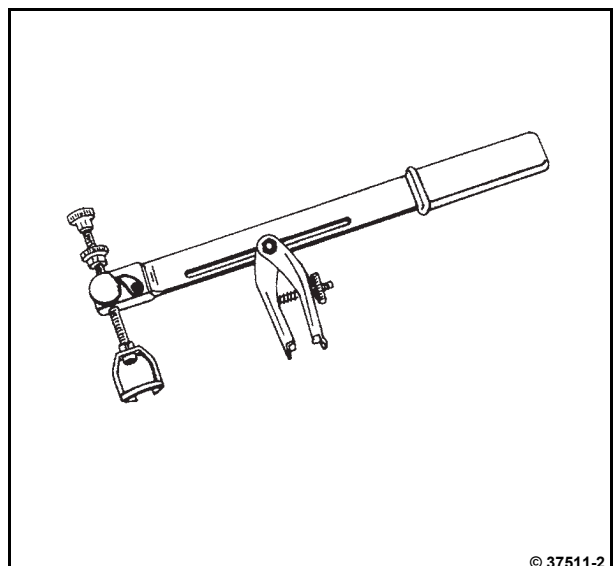
Size 15

3/4 inch

(in connection with rotation angle disc 8190)

**9017****Assembly lever**

Example: Removing and installing the valves



8 Special tools

Orders

The tools can be ordered directly, stating the order number, from:

WILBAER

Wilhelm Bäcker GmbH & Co.KG

Postfach 14 05 80

42826 Remscheid

Germany

Phone: +49 (0) 2191 9339-0

Fax: +49 (0) 2191 9339-200

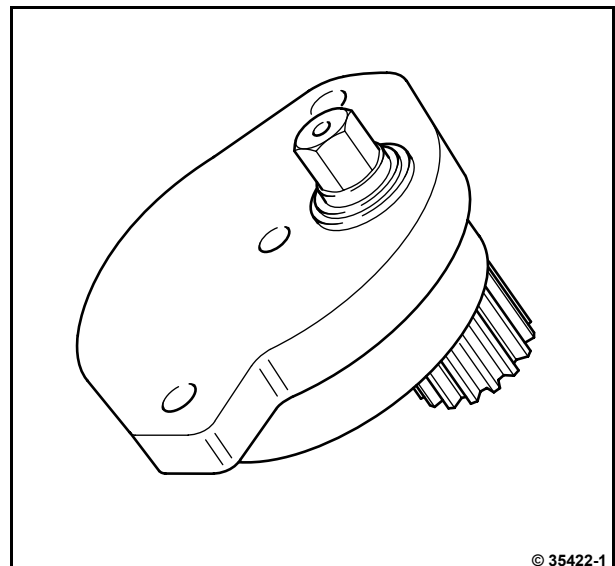
E-mail: info@wilbaer.de

Web: <http://www.deutz-tools.com>

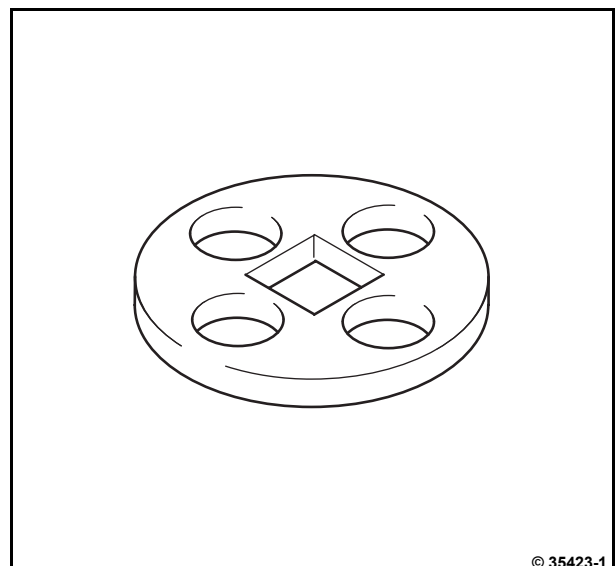
100 190
Connection piece
 (in conjunction with compression pressure tester 8005)



100 320
Turning gear
 flywheel side



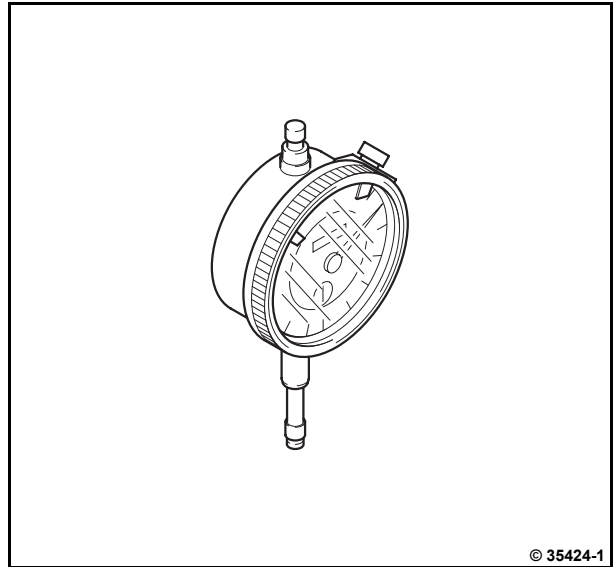
100 330
Turning gear
 V-belt pulley
 Turning crankshaft on torsional vibration damper



100 400

Dial gauge with fixing wheel

Measuring range 0 -10mm / 0.01mm



100 410

Digital gauge

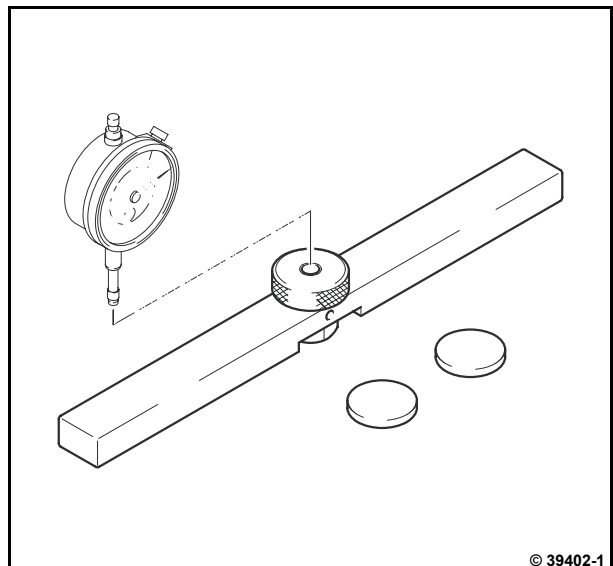
Measuring range 0 -30 mm / 0.01 mm



100 750

Measuring apparatus

Measuring bar with two spacing washers
(in conjunction with 100 400 or 100 410)
Checking valve lag dimension
Checking piston projection



103 050**Socket wrench insert**

Size 15

for valve clearance setting with removed exhaust return module

(in connection with 8190)

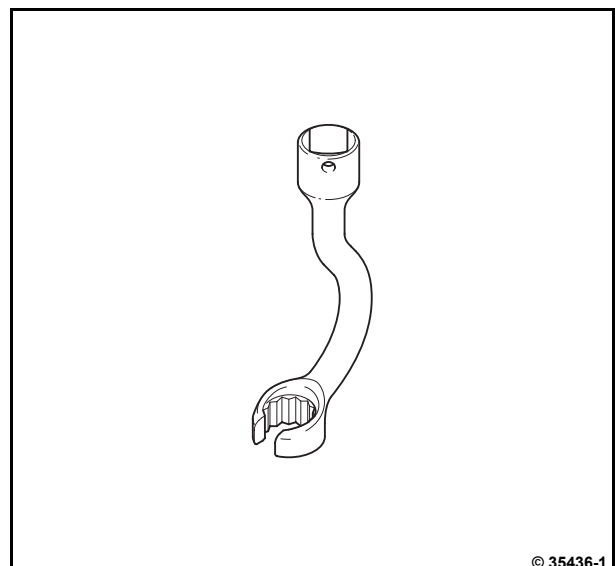
**103 220****Special pliers**

for removing the roller tappet

**110 500****Special wrench**

Size 17

Removing and installing high-pressure lines

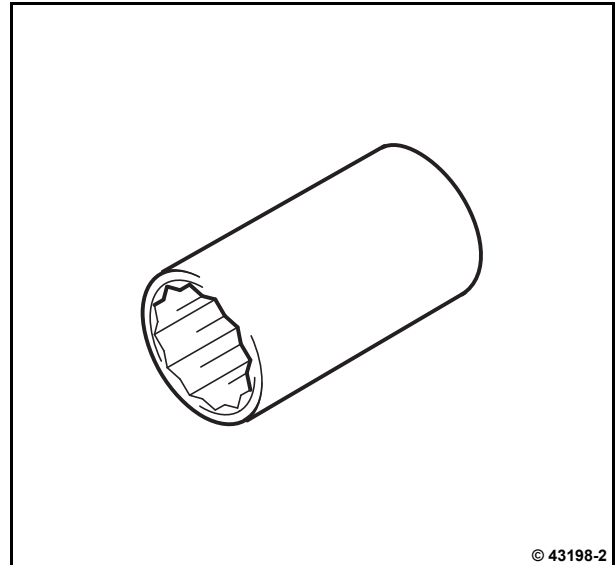


110 700

Socket wrench insert

long

Assembling/disassembling pressure sensors
(rail pressure, oil pressure, fuel pressure)



© 43198-2

110 900

Assembly case

Case for O-rings, complete with:

Disassembly tool 110 901 and three assembly sleeves
with guide:

- High pressure pump (Ø 36), 110 902
- Injector, 2V motor (Ø 16), 110 903
- Injector, 4V motor (Ø 23), 110 904

Disassembling/assembling O-rings



© 43208-0

120 430

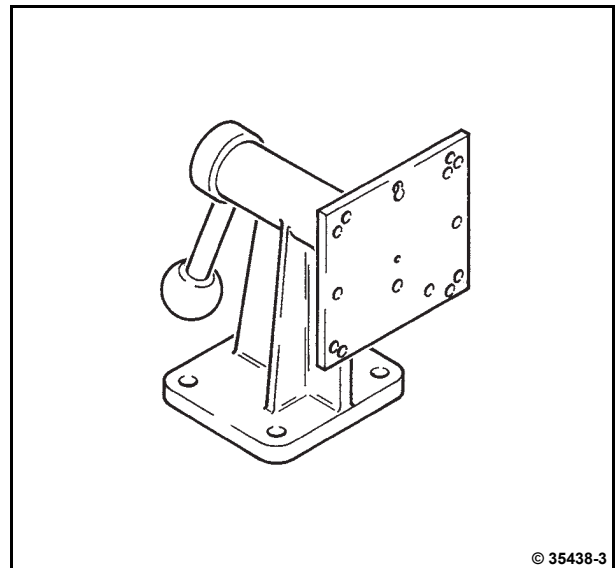
Assembly tool

Removing and installing the heating plugs

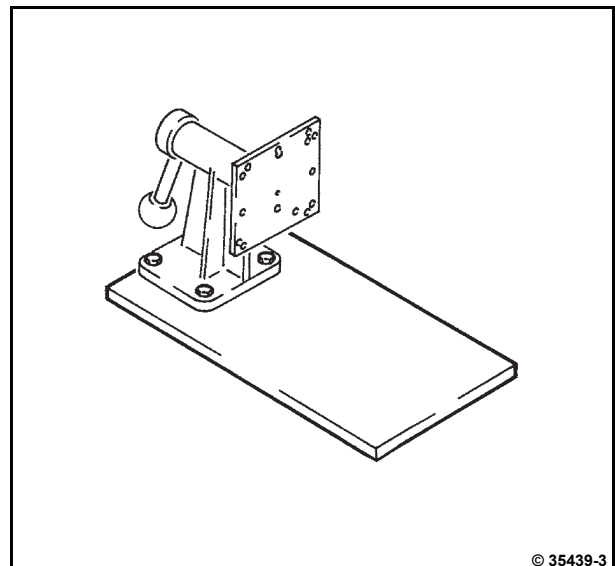


© 43020-0

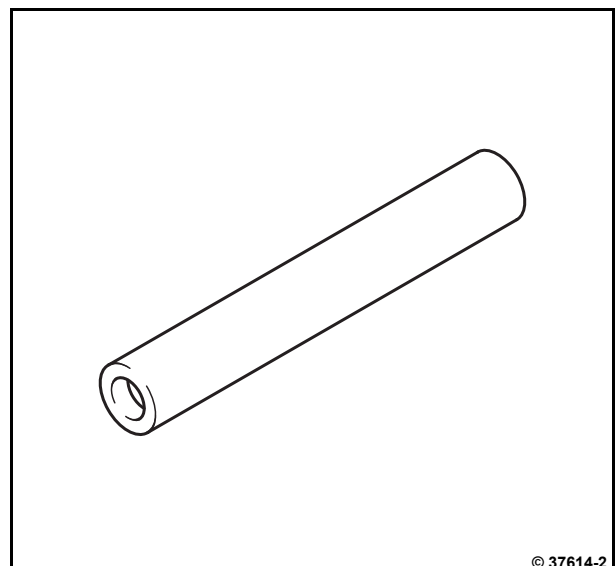
120 900
Support bracket
 pivoting
 Clamping cylinder head



120 910
Base plate for support bracket
 (in conjunction with support bracket 120 900 if support bracket is not screwed tightly)



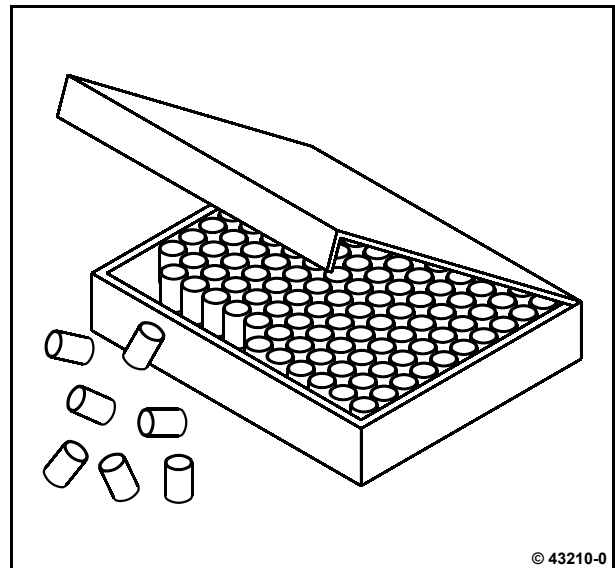
121 410
Assembly tool
 Assembling valve stem gaskets



121 420

Assembly sleeves

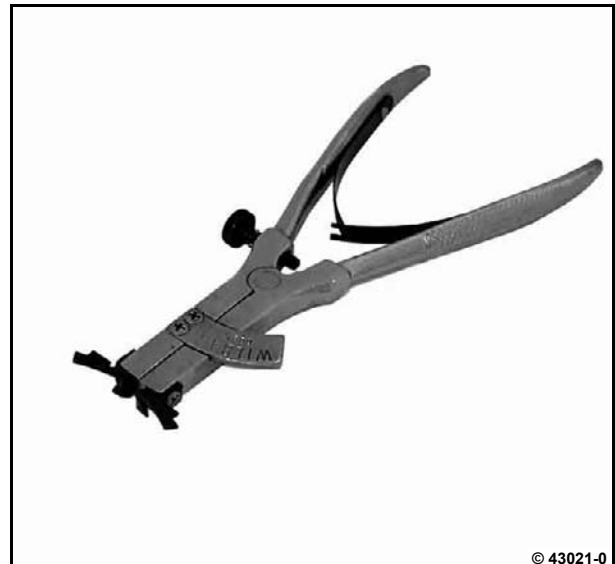
Set of assembly sleeves for valve stem gasket



130 300

Universal piston ring pliers

Removing and installing the piston rings

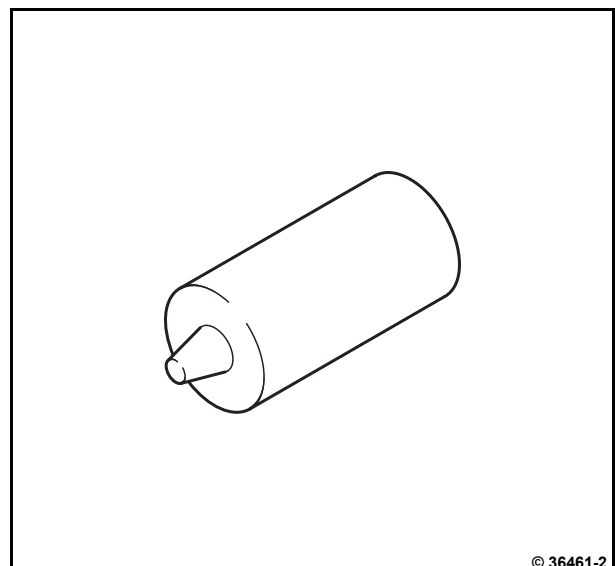


130 440

Trapezoidal groove wear gauge

for piston diameter 101 mm

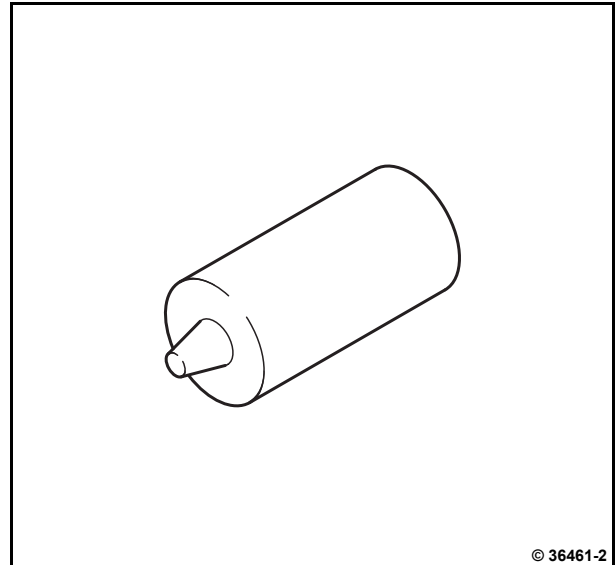
Check piston ring groove



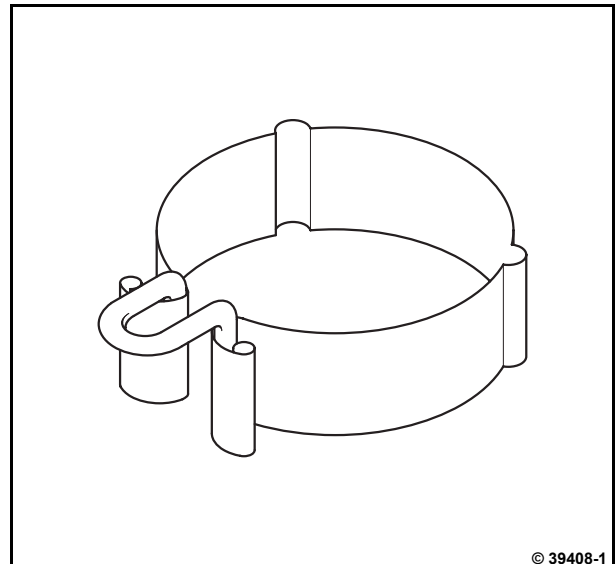
130 450**Trapezoidal groove wear gauge**

for piston diameter 98 mm

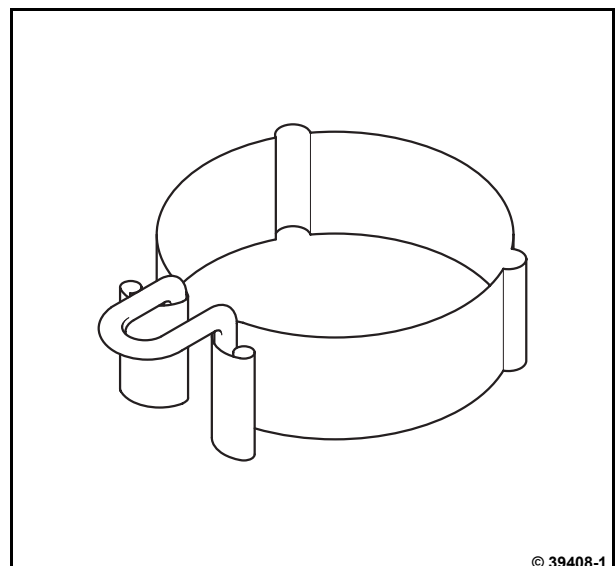
Check piston ring groove

**130 660****Piston ring tensioning band**

Piston diameter 98 mm

**130 670****Piston ring tensioning band**

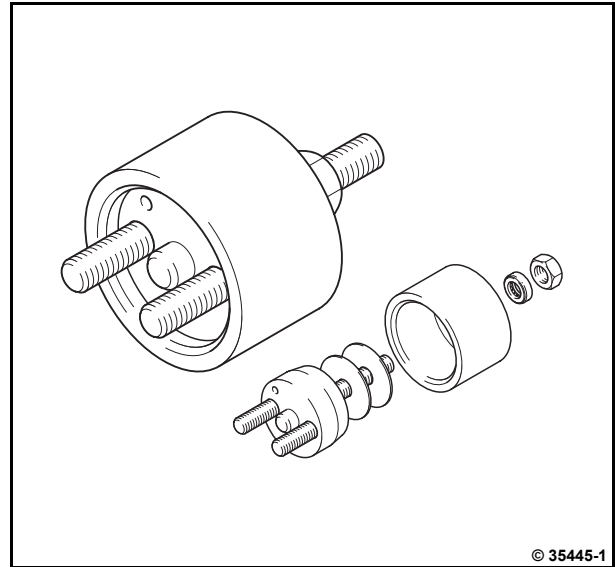
Piston diameter 101 mm



142 670

Assembly tool

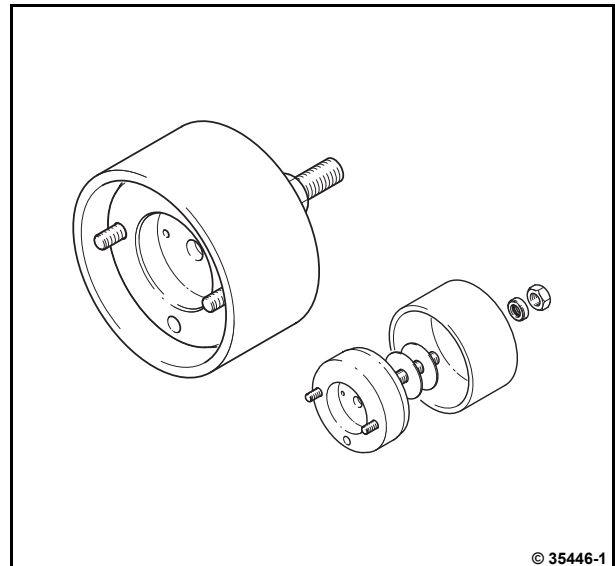
Assembling crankshaft sealing ring
(opposite side to flywheel)



142 830

Assembly tool

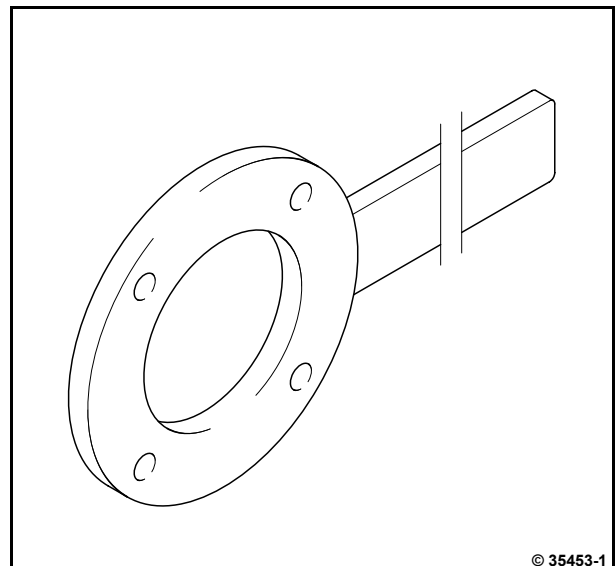
for crankshaft (flywheel side)



144 800

Counter support

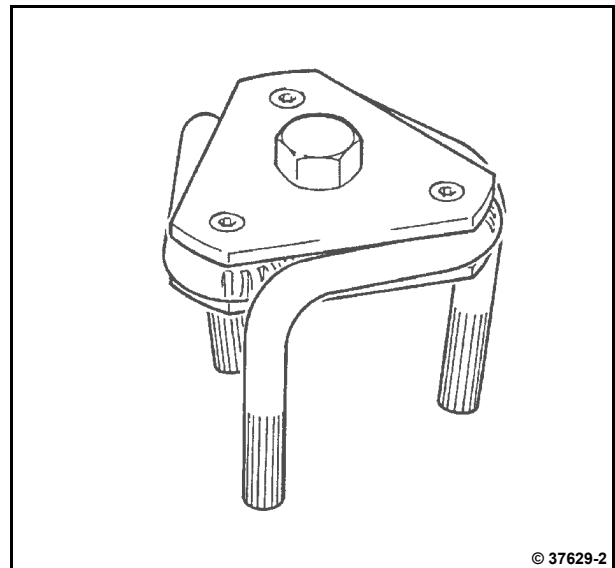
Torsional vibration damper



170 050

Special wrench

Unscrew the filter cartridges



170 160

Stoppers/caps

1 set of differently-sized stoppers and caps
Sealing openings on the fuel system

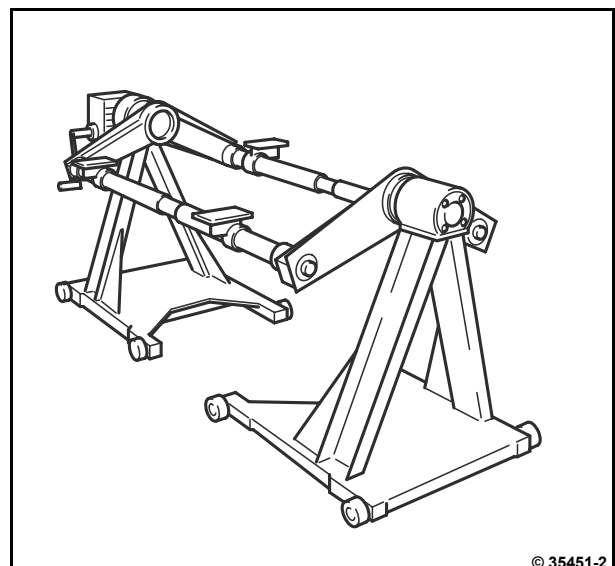


8

6066

Assembly block

Engine clamping, double-sided



6066/158

Clamping bracket

consisting of:

1 holder 6066/158-1 rear right,

1 holder 6066/158-2 rear left,

1 holder 6066/158-3 front right,

1 holder 6066/158-4 front left

(in connection with assembly block 6066)

Clamping of the engine, double-sided

